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REVIEW OF APPLIED MYCOLOGY

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HILTON (R. N.). **Studies in leaf diseases of Hevea in the nursery and the plantation.** —*Arch. Rubbercult. Ned.-Ind., 1953* (Extra nummer), pp. 149–154, 1953.

In this paper read at the Conference of Rubber Research Institutes in the Far East, held at Bogor, 15th to 17th July, 1952, notes are given on work carried out in Malaya on leaf diseases of rubber associated with *Gloeosporium albo-rubrum* [*R.A.M.*, 32, p. 588; 33, p. 256], *Colletotrichum ficus* [32, p. 338], *C. derridis* [loc. cit.], *Oidium heveae* [see preceding abstract], and, particularly, *Helminthosporium heveae* [33, p. 255].

In direct contrast to *H. heveae*, *O. heveae* is present throughout the year on rubber under both artificial and natural shade. *C. ficus* and *G. albo-rubrum* appeared to be less affected by shade. *C. ficus* seemed to be confined to plants growing in a pool of standing water.

Perithecia of *Ophiobolus*, *Leptosphaeria*, and *Mycosphaerella* [32, p. 588] were repeatedly found on dead tissue in association with *H. heveae*, and fruit bodies corresponding to the description of *Guignardia heveae* [cf. 6, p. 321] were found twice with *C. ficus*. A stage of heavy sporulation by *H. heveae* occurs which appears to be independent of prevailing weather conditions, but related to the age of the host. It persists for about a fortnight, and normally occurs when the plants are putting on their third or fourth flush. *Gloeosporium albo-rubrum*, *C. ficus*, and *C. derridis* spore during wet periods. *H. heveae* spores are exceptionally resistant to adverse conditions, but are produced in relatively small numbers. Appressoria able to penetrate the undamaged leaf cuticle were observed in *H. heveae*, *C. ficus*, *C. derridis*, and *G. albo-rubrum*.

Among the conclusions drawn from these studies the following merit further investigation: (1) sun and shade plants differ so widely in their anatomy and physiology that they constitute completely different organisms from the pathological point of view, apart from the direct effect of shade on the fungus; (2) waterlogging induces a reaction in the plant which modifies the behaviour of the pathogen; (3) age of the host is of the utmost importance; there is no disease common in its effects on nursery plants and mature trees; (4) at least in the case of *H. heveae* there appears to be an 'immune reaction' to infection, sporulation becoming reduced once the plant has undergone the stage of heavy sporing.

HUTCHISON (F. W.). **Experiments on the control of root disease in a replanting.**— *Arch. Rubbercult. Ned.-Ind., 1953* (Extra nummer), pp. 117–126, 3 graphs, 1 diag., 1953.

In this paper, read at the Conference of Rubber Research Institutes in the Far East, held at Bogor, 15th to 17th July, 1952, experimental evidence obtained in Malaya is given which shows that felling and stump poisoning to control *Hevea* root disease (*Fomes lignosus*, *F. noxius*, and *Ganoderma pseudoferreum*) [*R.A.M.*, 33, p. 256] becomes more expensive than the standard procedure (affected trees

dug out, healthy ones jacked out) when the cost up to the fourth year is included. Poisoning is unavailing where root disease is already present, but has some value in protecting healthy stumps against invasion by *F. lignosus*. Length of buried root samples had little effect on the period of survival of the fungi, but after two years *G. pseudoferreum* was still viable in sections ½ in. in diameter and *F. noxius* in 1 in. samples, whereas *F. lignosus* had disappeared from roots under 2 in. in diameter. Further work is in progress.

HUTCHISON (F. W.). **Development of fungicides for the treatment of diseases of the tapping panel.**—*Arch. Rubbercult. Ned.-Ind., 1953* (Extra nummer), pp. 136–140, 1953.

In this paper, read at the Conference of Rubber Research Institutes in the Far East, held at Bogor, 15th to 17th July, 1952, the author describes the methods of testing fungicides submitted by manufacturers for inclusion in the list of approved materials for the control of rubber mouldy rot (*Ceratostomella* [*Ceratocystis*] *fimbriata*) [*R.A.M.*, 30, pp. 387, 540 and above, p. 256]. The preparation is sprayed on agar plates seeded 24 hours previously with the fungus. Results are taken after six to seven days' incubation at room temperature. Phytocidal tests determine the maximum concentration that can be used on rubber trees without injury to the newly tapped bark, the latex, or prepared rubber. Field trials are undertaken during the wet season in conditions as favourable as possible to disease development. Single plots of 25 trees, each with a complete band of the fungus above the tapping cut, are allotted to each concentration of the fungicide. The trees are tapped every other day, and the fungicide applied immediately after collection of the latex. Treatment is continued for 14 applications or until control is achieved.

Some of the results with efficacious materials have already been given [30, p. 541] and fixanol V.R. has been added to the approved list under the name fylomac 90 [cf. 31, p. 295]. Cetyl trimethyl ammonium bromide (lissolamine A), which showed promise, was rejected on account of cost. In field tests 10 per cent. gentian violet added to fixanol delayed the rate of re-infection as compared with uncoloured fungicide.

VAN HEUSDEN (W. C.). **De Zuid-Amerikaanse bladziekte van Hevea brasiliensis Dothidella ulei P. Hennings (Mededeling van de Proefstations der C.P.V.).** [The South American leaf disease of *Hevea brasiliensis*, *Dothidella ulei* P. Hennings (communication from the C.P.V. Experiment Stations).]—*Bergcultures*, 22, 12, pp. 236–237, 1 col. pl., 1953.

All the Indonesian *Hevea* rubber plantations are believed to be planted with varieties susceptible to South American leaf blight (*Dothidella ulei*), and this popular description of the primary and secondary symptoms of the disease is intended to assist growers in its recognition and immediate notification to the nearest experiment station in the event of its introduction [*R.A.M.*, 33, p. 177] by air transport or other means.

MUNNECKE (D. E.) & FERGUSON (J.). **Methyl bromide for nursery soil fumigation.**—*Phytopathology*, 43, 7, pp. 375–377, 1953.

At the Department of Plant Pathology, University of California, Los Angeles, gaseous methyl bromide [*R.A.M.*, 32, p. 589; 33, p. 49], applied at the rate of 4 lb. per 100 cu. ft. of space for 24 hours, conferred a high degree of protection on [chilli] pepper and China aster in nursery flats artificially infested with *Rhizoctonia* [*Corticium*] *solani* and *Fusarium oxysporum* f. *callistephi*, respectively [cf. 27, p. 305; 31, p. 269], while plants in untreated inoculated soil contracted both pre- and post-emergence damping-off. Soil inoculated with pure cultures of *Botrytis cinerea*,

F. o. f. *gladioli*, *Phytophthora cinnamomi*, *P. citrophthora*, *Pythium ultimum*, *Sclerotinia homoeocarpa*, and *Sclerotium delphinii*, and camellia roots with *Phytophthora cinnamomi* [31, p. 553] were also freed from infection by the treatment, which was only partially effective, however, against *Verticillium albo-atrum* on sterile tomato stems. In tests to determine the depth of penetration of the gas, sclerotia of *S. delphinii* were killed at a depth of 30 in. in a clay loam but only down to 18 in. in a sandy loam. Less than 4 lb. per 100 cu. ft. failed to control *C. solani* and *F. o.* f. *callistephi* in soil with a high organic content.

No toxic effects resultant on fumigation with methyl bromide were observed on 17 species of plants in a greenhouse chamber adjoining the treated area, nor was the soil harmful to seeds or transplants if aerated 24 hours before use.

SULOCHANA (MISS C. B.). **Soil conditions and root diseases: IV. The effect of micro-elements on the occurrence of bacteria, actinomycetes and fungi in soils.** —*Proc. Indian Acad. Sci.*, Sect. B, 36, 1, pp. 19–33, 1952.

Further studies in the University Botany Laboratory, Madras, were aimed at a quantitative estimation of bacteria, actinomycetes, and fungi in 'wilt-sick' soils, amended with trace elements, and their possible relationship with the saprophytic activity of *Fusarium* spp. [cf. *R.A.M.*, 32, pp. 36, 430]. All the micro-elements tested, except zinc and nickel, increased the fungus population considerably, lithium giving a fivefold increase in numbers assessed by the dilution plate technique, manganese, molybdenum, cobalt, boron, and aluminium giving a threefold increase over the unamended controls.

HAARLØV (N.) & WEIS-FOGH (T.). **A microscopical technique for studying the undisturbed texture of soils.**—*Oikos*, 4, 1, pp. 44–57, 8 pl., 2 diags., 1953.

At the Zoological Laboratory and the Neurophysical Institute, Copenhagen, undisturbed samples of soil were secured by freezing a block taken with a sampler and cutting smaller blocks from it. These were embedded in 2 per cent. agar, then hardened in alcohol, which permitted thin serial sections to be cut. After selective staining it was possible to examine microscopically the microflora, including fungus hyphae, *in situ*.

PRAKASH (R.) & SAKSENA (R. K.). **Decomposition of Paddy and Bajra (Pennisetum typhoideum) straws by fungi commonly found in Allahabad soils.**—*Proc. Indian Acad. Sci.*, Sect. B, 36, 3, pp. 119–128, 4 graphs, 1952. [Received 1953.]

The aerobic decomposition of paddy rice and bajra (*Pennisetum typhoides*) straws by 22 fungi isolated from Allahabad soils [cf. *R.A.M.*, 29, p. 329] was studied under controlled conditions in the Botany Department, University of Allahabad, using Dawson's method [loc. cit.]. The amount of decomposition was determined by the evolution of carbon dioxide and ammonia, the loss in weight, and loss of total carbon during seven days. *Penicillium luteum* and *Curvularia lunata* were the only species positive in a test for oxidase activity but the former was one of the least active in decomposition. There was no uniformity in the rates of decomposition by the various fungi, nor did the pH of the straw affect the rate of decomposition. Correlation between the loss in weight of the straw and the total carbon decomposed was quite good. Maximum decomposition by *Cunninghamella bertholletiae*, *Aspergillus niger*, *P. fellutanum*, and *Curvularia lunata* was reached on the third day and by the majority of the others on the sixth day.

LEGG (J. T.). **The natural spread of nettlehead disease of Hops.**—*Rep. E. Malling Res. Sta., 1952*, pp. 123–127, 5 diags., 1953.

A statistical analysis of records from 1948 to 1952 of the incidence of nettlehead

disease [*R.A.M.*, 31, p. 350] in a garden of Bramling hops in Kent demonstrated that the plants immediately adjacent to infected plants were more liable to contract the disease than those further away.

BEARD (F. H.). **Seven clonal selections of Golding Hops.**—*Rep. E. Malling Res. Sta., 1951*, pp. 189–196, 1952.

Seven initially disease-free Golding hop clones were tested at East Malling from 1944 to 1949 for their suitability for general cultivation. In 1945 there was a mild attack of *Sphaerotheca humuli* [*R.A.M.*, 32, p. 278] on each variety and a few hills developed symptoms of hop mosaic virus [33, p. 69; loc. cit.]. All varieties were more or less equally liable to severe infection of the laterals in June and July by *Pseudoperonospora humuli* [loc. cit.], which was the most serious disease, especially from 1946 onwards. Over the whole period Early Bird developed the fewest 'spikes' (shoots characteristically stunted by the disease) and Canterbury Golding the most (30 and 656 per 100 hills, respectively). Canterbury Golding, Mathon, Bramling, Eastwell Golding, and Early Bird suffered severely from infection of the bine below ground, especially the first two varieties.

PAINE (J.). **Insect vector studies with mosaic and other virus diseases of the Hop.**—*Rep. E. Malling Res. Sta., 1952*, pp. 120–122, 1 pl., 1953.

Some of this information from East Malling on the transmission of hop mosaic virus by *Phorodon humuli* has already been noticed from another source [*R.A.M.*, 32, p. 278]. The wingless form of *Macrosiphum euphorbiae* also transmitted the virus. Both, in addition, apparently transferred hop split leaf blotch virus [31, p. 350] and a suspected virus inducing line-pattern symptoms on hop.

KEYWORTH (W. G.), HITCHCOCK (MARGARET M.), & GOODE (PAMELA M.). **Verticillium wilt of the Hop VII. Further studies on wilt-resistant varieties.**—*Rep. E. Malling Res. Sta., 1952*, pp. 112–119, 1953.

Further work in this series [cf. *R.A.M.*, 33, p. 180] is devoted to an account of research since 1947 on hop varieties resistant to wilt (*Verticillium albo-atrum*) [33, p. 69]. The more resistant varieties varied in relative wilt incidence both from year to year and from farm to farm, but this was due probably to environmental conditions rather than to pathogenic differences in strains of the fungus. In field trials most of the selected varieties showed progressively less wilt in succeeding years, the symptoms resembling those typical of the 'fluctuating' kind. Although many resistant varieties have been found none is yet regarded as an entirely acceptable substitute for Fuggle.

HENNER (J.). **Pflanzenschutzprobleme im Hopfenbau.** [Plant protection problems in the cultivation of Hops.]—*Pflanzenarzt*, 6, 7, pp. 1–2, 1953.

The relation of downy mildew (*Pseudoperonospora humuli*), one of the limiting factors in the cultivation of hops in Austria [C.M.I. map No. 14], to meteorological conditions is briefly discussed and directions given for its control by spraying at ten-day to fortnightly intervals with 1 to 1·5 per cent. Bordeaux mixture or copper oxychloride as prescribed. Mould (*Sphaerotheca humuli*) is important only in certain localities. Direct measures against the die-back of the cones caused by *Cladosporium herbarum* and the basal rot due to *Fusarium* sp. are impracticable, but there appear to be differences in varietal reaction to these pathogens.

SACKSTON (W. E.). **Foot and root infection by Safflower rust in Manitoba.**—*Plant Dis. Reptr*, 37, 10, pp. 522–523, 1 fig., 1953. [Multilithed.]

Safflower rust (*Puccinia carthami*) [*R.A.M.*, 31, p. 632] caused foot and root infection in 1953 in a nursery at Altona, Manitoba, where the crop was growing for the

second year. Infection was apparently seed- or soil-borne [cf. 33, p. 50]. The percentage survival in the varieties N–520 and N–803–13–2 was 45 and 55, respectively, compared with 1 to 8 in five other varieties.

De Souza (J. G. C.). **Como manter os canaviais livres do mosaico.** [How to maintain the Cane plantations free from mosaic.]—*Bras. açúc.*, 41, 5, pp. 69–73, 1953.

A scheme is outlined for the roguing of sugar-cane plantations in São Paulo, Brazil, with a view to the eradication of mosaic virus [*R.A.M.*, 31, p. 459] and incidentally of leaf scald (*Phytomonas* [*Xanthomonas*] *albilineans*) [31, p. 375] and smut [*Ustilago scitaminea*: 31, p. 400]. Healthy setts should preferably be planted in an isolated situation or at any rate surrounded by a border 20 in. in width of the practically immune C.P. 27–139, or if this variety is not available, of the highly tolerant Co. 421. The period of major activity of the principal aphid vector of mosaic, *Aphis maidis*, covers the hot, rainy season from January to March and coincides with large-scale industrial planting operations. Resistant varieties may be planted in January, but from the latter part of February onwards is a more suitable time for the establishment of Co. 290 and Co. 413. The former variety is regarded as tolerant, but severe mosaic infection may reduce its yields by up to 20 or 30 per cent., while an improvement of 15 to 20 per cent. in its production is effected by roguing. Co. 413 is only slightly susceptible and when attacked is more tolerant than Co. 290. Assuming that planting for 'seed' is concluded by the beginning of March, the first inspection for roguing should be made 45 days to two months later, say in the latter part of April, and the second from the end of May to mid-June, the third at the corresponding period from July to August, and the fourth in September or October.

At the Experiment Station, Jaú, the total cane yields from two harvests (July, 1948, and September, 1949), of mosaic-free and diseased Co. 290 were 252·4 and 198·9 tons, respectively, the corresponding figures for sugar being 31·7 and 25·2. In a report from the Cane Experiment Station, Piracicaba, dated 12th April, 1951, Dr. H. C. de Arruda states that roguing increased the yield of manured cane by an average of 10·4 per cent. and that of unmanured by 42·4 per cent.

Hiratsuka (N.) & Sato (S.). **A contribution to the knowledge of the rust flora of Mt. Fuji and its vicinities, Fuji-Hakone National Park. (Contributions to the rust flora of Eastern Asia. VII.)**—*Nagaoa* (*Mycol. J. Nagao Inst.*), *1953*, 3, pp. 57–100, 1953. [Japanese and English.]

This is a list of 207 Uredinales identified in Japan since 1947 [cf. *R.A.M.*, 31, p. 402]. It includes one new species and *Melampsora lini* on *Linum stellarioides* [C.M.I. map No. 68], *Cronartium quercuum* on oaks and pine (*Pinus densiflora*), *Uromyces appendiculatus* on bean (*Phaseolus vulgaris*), *U. caryophyllinus* [*U. dianthi*] on *Dianthus superbus* var. *longicalycina*, and *Puccinia allii* on cultivated Welsh onion (*Allium fistulosum*).

Kominami (K.), Kobayasi (Y.), & Tubaki (K.). **Enumerations of the moulds of Japan IV.**—*Nagaoa* (*Mycol. J. Nagao Inst.*), *1953*, 3, pp. 1–4, 3 figs., 1953.

Included in these notes on four fungi from Japan is a description of the conidial stage of *Laetiporus* [*Polyporus*] *sulphureus* var. *miniatus*, with thick-walled, frequently catenulate, pyriform to globose spores, 5·5 to 11 by 5 to 9 μ, on the fallen trunk of a frondose tree, and of the conidial state of *Fistulina hepatica*, characterized by abundant spherical spores, at first small and hyaline, 1 to 2 μ diameter, later more reddish and 2 to 4 μ, occurring on trunks of *Shiia sieboldi*.

ESFANDIARI (E.). **Quatrième liste de fungi de l'Iran.** [Fourth list of fungi of Iran.] —*Ent. Phytop. appl., Téhran, 1951*, 12–13, pp. 1–26, 1951. [Also in Persian (43 pp.). Received 1953.]

This annotated list of Persian fungi [cf. *R.A.M.*, 29, p. 231; 31, p. 354] includes all the species published in *Sydowia* in 1949 and 1950 [29, p. 336] and, *inter alia*, *Puccinia carthami* on *Carthamus oxyacanthus*, *Septoria dianthi* on *Dianthus* sp., *S. davatchii* on a poplar (*Populus*) hybrid, and *Stigmina esfandiarii* (*Sydowia*, 4, p. 35, 1950), causing severe damage to vines.

KHABIRI (E.). **Contribution à la mycoflore de l'Iran. Première liste.** [A contribution to the mycoflora of Iran. First list.]—*Rev. Mycol.*, 17, 2, pp. 154–157, 1952.

This list of parasitic fungi from Persia [see preceding abstract] includes *Polystigma rubrum* on *Prunus* sp. [C.M.I. map No. 148], *Puccinia glumarum* on wheat [No. 97], *Ascochyta syringae* on lilac, *Septoria petroselini* on parsley, *S. piricola* [*Mycosphaerella sentina*] on pear and apple, *Gloeosporium ampelophagum* [*Elsinoe ampelina*] on *Vitis* sp. [No. 234], *Ramularia areola* on *Gossypium* sp., *Cercospora beticola* on beet [No. 96], and *Heterosporium allii* [var. *cepivorum*] on onion.

LINDQUIST (J. C.). **Notas uredinológicas.** [Uredinological notes.]—*Rev. Fac. Agron., B. Aires*, 28 (*1951–52*), pp. 213–228, 1952. [English summary. Received June, 1953.]

This is an annotated list of 26 rust fungi occurring in Argentina [cf. *R.A.M.*, 27, p. 45], three of which are new aecidial species; the remainder are new host or country records, including *Puccinia helianthi* on sunflower [C.M.I. map No. 195] and *P. menthae* on *Mentha arvensis* and *M.* sp. [No. 211].

VIENNOT-BOURGIN (G.). **Ustilaginales d'Afrique (deuxième note). Étude critique du genre Mycosyrinx.** [The Ustilaginales of Africa (second note). A critical study of the genus *Mycosyrinx*.]—*Rev. Bot. appl.*, 32, 335–356, pp. 253–264, 14 figs., 1952.

In this contribution to the present series [cf. *R.A.M.*, 31, p. 633] the author describes a comparative study of different specimens of *Mycosyrinx* on *Cissus* spp. from America and Africa. He distinguishes four species: *M. arabica* [15, p. 830] (from India), *M. cissi* (Antilles, Peru, and Brazil), *M. microspora* (Brazil, Belgian Congo, and Ivory Coast), and *M. globosa* n.sp. [with French diagnosis only] (Venezuela, French Guiana, and French Congo).

WEHMEYER (L. E.). **On the status of the generic names Pyrenophora and Pleospora.** —*Mycologia*, 45, 4, pp. 562–570, 1953.

The author gives reasons in support of the view that *Pleospora allii*, with Rabenhorst's Herb. Myc. I, *838* of *Sphaeria allii* as the type, should be designated the lectotype of the genus *Pleospora* [*R.A.M.*, 32, p. 452]; that the genus name *Pyrenophora* should be removed from the Ascomycetes to the Fungi Imperfecti near *Sclerotium* as a form genus name, because of the sterile nature of the type material, and that until the proper taxonomic limits of the group of species about *Pleospora phaeocomes* can be determined these species should be retained as a subgroup of the genus *Pleospora*.

DE JONG (P.). **Part II—Research and Industry.**—*Rep. Tea sci. Dep. un. Pl. Ass., 1951–1952*, pp. 3–13, 2 graphs, 1952.

In this report [cf. *R.A.M.*, 30, p. 390] the results are given of trials with seven copper dusts, six copper sprays, and one mercury spray for the control of tea blister blight [*Exobasidium vexans*] in southern India [32, p. 514], in comparison

with standard perenox (4 oz. in 10 gals. water) [33, p. 186]. Applications were made at seven-day intervals from 21st July, 1951, until 10th January, 1952, the dusts being applied with an Acme Powder Blower at a rate of 10 lb. per acre and the sprays at 15 gals. by means of a Leo-Colibri No. 7 pressure knapsack sprayer fitted with a low-volume nozzle. In general, the dusts were less efficient than the sprays though there was little significant difference. The mercury fungicide (19·2 per cent. leaf infection) and fungex (Murphy Chemical Company, 19·7) were superior to the other fungicides (2–2–40 Bordeaux mixture and cuprocide, 25·4 to 37·8); the untreated had 80 per cent. infection. No mercury residue could be detected in oven-dried green leaf samples either by quantitative or spectrographic analysis.

A trial to investigate the relative values of sprays and dusts in protecting bushes recovering from pruning was conducted on an area of tea pruned during June, 1951, divided into two blocks of six plots each, and treated as follows: (*a*) none, (*b*) and (*c*) perenox (2 and 4 oz. in 10 gals. water) at 17 gals. per acre, (*d*) and (*e*) 2 and 6 per cent. cuprosana dust, and (*f*) 4 per cent. perelan dust, all at 10 to 15 lb. per acre. The first application was made on 18th July, 1951. Although the results were not statistically analysed 4 oz. perenox and 6 per cent. cuprosana dust gave a fair degree of control with average leaf infection of 29·7 and 33 per cent., respectively, as against 80·6 for the untreated. Although the sprayed plots appeared to be more free from disease than the dusted plots a higher degree of infection was found inside the sprayed bushes at tipping.

On the Mayfield Estate 356 acres of tea were dusted with a Whirlwind machine using 2 per cent. cuprosana at an average rate of 10 lb. per acre per round. Plucking rounds averaged eight to nine days and the number of whole and part rounds varied from 18 to 26. The yields of green leaf per acre from August, 1951, to January, 1952, from two of these fields, Nos. 11 and 20, were 2,577 and 2,546 lb. per acre, respectively, compared with 1,997 lb. for an untreated field (No. 16). Further evidence of the efficiency of copper dust was obtained on the Wentworth Estate. Throughout the season 6,372 acres were covered with 62,502 lb. of the dust at an average running cost of Rs.5.282 per acre per round, agreeing closely with cost figures for the Mayfield Estate.

From these experiments it is concluded that when blister blight is not too severe, as in 1951, 2 per cent. cuprosana dust applied every 7 to 10 days at about 10 lb. per acre gives adequate protection to tea in plucking, increases the crop, and imparts a more vigorous appearance at the end of the blight season. However, where the tea is subjected to severe or prolonged attack a 4 per cent. dust is required to give adequate protection.

K. S. Venkataramani reports (pp. 26–29) that blister blight was controlled satisfactorily in a pilot trial in which an oil-based copper fungicide developed by Clean Crops Ltd. (1 part to 3 parts water) was sprayed on to the bushes by means of a hand atomizer.

In July, 1951, red 'rust' caused by *Cephaleuros parasitica* [27, p. 260] was widespread on an estate in central Travancore. It caused shoot dieback and poor development in certain fields of rested and young tea. Any measures promoting rapid, vigorous growth of young plants and spraying with a copper-based fungicide should effect control.

The common primary root diseases constantly reported were red root rot (*Poria hypolateritia*), black root rot (*Rosellinia arcuata*), charcoal stump rot (*Ustulina zonata*), and brown root (*Fomes noxius*) [32, p. 216]. The last two predominated in Mysore, Nilgiri-Wynaad, and central Travancore.

Defoliation and shoot dieback of *Grevillea robusta* nursery plants in the Nilgiris was caused by *Amphichaeta grevilleae* [29, p. 511], a new record for southern India. Laboratory tests indicated that spraying with 1 per cent. Bordeaux mixture or 0·25 per cent. perenox would check its spread.

COMMONER (B.) & NEHARI (VARDA). **The effects of Tobacco mosaic virus synthesis on the free amino acid and amide composition of the host.**—*J. gen. Physiol.*, 36, 6, pp. 791–805, 8 graphs, 1953.

At the Henry Shaw School of Botany, St. Louis, Missouri, changes in the concentrations of free amino acids and amides during the time of tobacco mosaic virus formation [*R.A.M.*, 32, p. 218 and following abstracts] were determined in inoculated tobacco leaf disks and compared with uninfected material. During the period of rapid virus formation there was a transitory deficiency in glutamine, asparagine, aspartic acid, glutamic acid, serine, and to a lesser extent in valine, threonine, and proline. Smaller deficiencies in the concentrations of these components were also observed about 100 hours earlier, probably in association with the early synthesis of a non-virus protein. It appears unlikely, from a comparison of these effects with the known amino acid composition of tobacco mosaic virus, that the virus protein is synthesized by condensation of appropriate free amino acids, the observed deficiencies probably resulting from removal of ammonia from the nitrogen pool during the synthesis of new proteins [cf. 32, p. 647]. It is suggested that the changes in free amino acid concentrations accompanying virus formation may account for some of the virus symptoms, e.g., foliar distortion.

COMMONER (B.), SCHIEBER (DOROTHY L.), & DIETZ (PHYLLIS M.). **Relationships between Tobacco mosaic virus biosynthesis and nitrogen metabolism of the host.**—*J. gen. Physiol.*, 36, 6, pp. 807–830, 11 graphs, 1953.

Comparisons of the nitrogen content of tobacco leaf disks at various intervals after inoculation with tobacco mosaic virus and uninoculated revealed a net increase in protein content as a concomitant of virus synthesis [see preceding and following abstracts]. It is attributed to (*a*) the virus itself, (*b*) an excess of insoluble protein developing soon after inoculation and ending about 100 hours before the cessation of virus synthesis, and (*c*) a variable excess of soluble non-virus protein limited to the period of synthesis. The appearance of the virus is accompanied by a deficiency in non-protein nitrogen.

The following information is based on the results of isotope experiments with N^{15}-labelled nutrient. The bulk of the virus nitrogen is derived from the free ammonia of the host tissue. Amino acid residues of tobacco mosaic virus protein are not derived from the corresponding free amino acids in the host. First an insoluble precursor is synthesized, which is then converted into tobacco mosaic virus or some soluble intermediate protein. This effect is associated with a cell particulate representing a small fraction of the total insoluble protein; infected tissue synthesizes *de novo* small amounts of soluble non-virus protein, which may be interpreted as intermediates in the process of synthesis. Infected tissue does not synthesize the rapidly turned-over soluble protein, which appears in comparable uninoculated material. Tobacco mosaic virus synthesis is preceded by a temporary enhancement of the metabolic stability of an insoluble protein component.

It is concluded that tobacco mosaic virus formation is incited by the diversion from its normal course of some part of the protein-synthesizing apparatus of the host.

COMMONER (B.), NEWMARK (P.), & RODENBERG (S. D.). **An electrophoretic analysis of Tobacco mosaic virus biosynthesis.**—*Arch. Biochem., N.Y.*, 37, 1, pp. 15–36, 5 figs., 7 graphs, 1952.

In a further study in this series [cf. preceding and next abstracts] the authors describe in detail an electrophoretic analysis of the time course of tobacco mosaic virus biosynthesis in nutrient-cultured tobacco leaf blade tissue. The mobility of the virus formed during the time course (average $-9{\cdot}7 \times 10^{-5}$ sq. cm. by volume

per second) was fairly constant and agreed with that of the inoculum. Calculations of the virus concentration from the areas of scanning peaks of the electrophoretic patterns resulted in values comparable with those obtained by microanalytical determination. A new electrophoretic protein component, B, appeared suddenly in infected tissues when the virus content reached about one-third of its maximum and thenceforward increased in parallel with the virus. The average mobility of B is $-3{\cdot}4\times10^{-5}$ sq. cm. by volume per second, it is soluble between pH 4·6 and 7, and its molecular weight seems to be relatively low. Both uninoculated and infected leaf tissue contain a heterogeneous electrophoretic component, group A, with an average mobility of $-6{\cdot}9\times10^{-5}$ sq. cm. by volume per second. The proteins of this group precipitate between pH 4·6 and 5·5 and evidently account for the major part of extractable non-virus protein. Their concentration is variable with time, indicating that, unlike tobacco mosaic virus and component B, they are readily metabolized. Most of them are of low molecular weight, but all samples included a high molecular weight component of $S20 = 19$ to 23, the concentration of which is proportional to that of group A and of the total protein content of leaf extracts.

Low concentrations of thiouracil were found to block the biosynthesis of tobacco mosaic virus [*R.A.M.*, 32, p. 515]; in a 0·0001 *M* solution the leaf tissue formed 40 per cent. of the virus concurrently present in untreated samples, but component B did not develop. The excess of group A proteins associated with tobacco mosaic virus formation was greater in thiouracil-inhibited than in untreated tissue. In 0·001 *M* thiouracil no virus was formed and the group A concentration was minimal, but at higher levels the proportion of group A approximated to that of the uninoculated material.

It is considered possible that component B represents a precursor of tobacco mosaic virus, and that some part of the group A complex is involved in its biosynthesis.

Commoner (B.), Yamada (M.), Rodenberg (S. D.), Wang (T.-Y.), & Basler (E.). **The proteins synthesized in tissue infected with Tobacco mosaic virus.**—*Science*, 118, 3071, pp. 529–534, 2 figs., 4 graphs, 1953.

Some of the information resulting from this investigation to determine the number and nature of proteins synthesized in plant tissue after inoculation with tobacco mosaic virus has been noticed from other sources [see preceding abstracts]. The soluble protein content of infective White Burley tobacco leaves was compared with that of healthy leaves after fractionation. After removal of the tobacco mosaic virus the subsequent electrophoretic pattern clearly showed the presence of three other proteins [cf. *R.A.M.*, 31, p. 211] also associated with infection. The precipitate obtained by bringing the ultracentrifuge supernatant fluid to pH 3·4 was found to contain two electrophoretically distinguishable proteins [cf. loc. cit.], the slower, with a mobility identical with B [see preceding abstract] and X [32, p. 346], being now designated B 3. The faster, named B 6, is hitherto unreported. After the removal of these two proteins, the remaining fluid was found to contain a soluble protein designated A 4. These three non-virus proteins have never been detected in healthy leaves. Infected leaves contain 50 to 100 mg. of B 3 and B 6 per gm. of leaf, and up to 25 mg. of A 4, while the amount of tobacco mosaic virus is 2,500 mg. These accessory proteins are non-infectious when inoculated into tobacco plants, and contain no nucleic acid. When they are purified and brought to pH 5 they polymerize, the polymerization of B 6 and A 4 being reversible, but not that of B 3. The aggregate form of B 3, named B 8, is very similar to tobacco mosaic virus in electron micrographs [cf. 32, p. 593]. Further data in support of the similarities between tobacco mosaic virus and B 8 have been obtained from serological reactions, since both react with a serum prepared against

an electrophoretically homogeneous preparation of B 8. Similarly, B 6, B 3, and A 4 cross-react with anti-tobacco mosaic virus serum [cf. 32, p. 514]. Protein fractions from healthy leaves show no precipitation with anti-B 8 or anti-tobacco mosaic virus sera.

In immunochemical reactions B 3, B 6, and A 4 could not be detected in tobacco leaves until about 220 hours after inoculation with tobacco mosaic virus, by which time the virus had reached one-third of its maximum concentration. More than half the final A 4 content appeared in the 24 hours just before the end of the 220-hour period, while B 6 appeared more slowly but its formation continued after both the virus and A 4 rates had levelled. Protein B 8 was not detectable until 280 hrs. after inoculation.

It is suggested that the late appearance of the non-virus proteins is due to a qualitative change in the mechanisms engaged in the formation of tobacco mosaic virus, possibly some change in the nucleic acid metabolism, since there is none present in the non-virus proteins. Observations on the nucleic acid metabolism of infected and healthy tobacco leaves showed that excess nucleoprotein developed in inoculated tissue after 100 hours, before the appearance of tobacco mosaic virus, and fell to zero at 203 hours.

It is concluded that each of the three non-virus proteins plays a specific part in the multiplication of tobacco mosaic virus in plant tissue.

Tolba (M. K.) & Saleh (A. M.). **Correlation between pH-value of Tomato tissue and its susceptibility to attack by two Fusaria.**—*Nature, Lond.*, 173, 4393, p. 87, 2 graphs, 1953.

Experiments in the Department of Botany, University of Cairo, Giza, Egypt, demonstrated that the susceptibility of ripe (red) and unripe (green) tissue of the tomato varieties Pritchards, North Dakota, and *IAB* to rotting by *Fusarium culmorum* [cf. *R.A.M.*, 32, p. 164] and *F. oxysporum* [31, pp. 450, 636] appeared to decrease as the pH value increased.

Williams (P. H.), Sheard (Enid), & Read (W. H.). **Didymella stem rot of the Tomato.**—*J. hort. Sci.*, 28, 4, pp. 278–294, 2 pl., 1953.

This is an account of investigations carried out at Cheshunt Experimental Station since 1942 on tomato stem rot (*Didymella lycopersici*) [*R.A.M.*, 32, pp. 608, 610], most of which has appeared in the Station *Reports*. In order to clarify the position in relation to the tomato canker described by Massee (Diseases of cultivated plants and trees. Duckworth, 1915) as due to *Mycosphaerella citrullina* [cf. 29, p. 318], cross-inoculations were carried out by Sheard. They showed that the host ranges of the two fungi are distinct.

Much difficulty is experienced by growers in distinguishing the lesions of stem rot from those caused by *Botrytis cinerea*, which are paler, the host cortex remaining hard and the characteristic grey mould usually being present.

Experimental evidence indicated that *Solanum nigrum* is the only other host on which *D. lycopersici* may overwinter [24, p. 90]; if the stem is infected late in the year it may produce spores in the spring. Potatoes near an affected crop may be attacked late in the season, but ploughing and rapid decay of the haulm should prevent infection from being carried over, unless tomatoes are grown on the same ground.

It would appear that where diseased plant remains are left in unsterilized soil the fungus is likely to remain there for a considerable period. Where, however, unsterilized soil is exposed to infection by airborne spores, the chances of the fungus becoming established are much less.

The spores survived dryness for 15 days. Kept at about −5° C., the viability of spores in a suspension gradually decreased; after six weeks most germinated in 48

hours, but after nine weeks only 2 per cent. germinated in 72 hours. Spores in pycnidia appeared to be even more resistant to cold.

Germination of infected seed was 50 per cent. and though some seedlings emerged bearing the infected seed coats none became infected, and no plants from them, during three months' growth. As most of the seed used in the tomato industry is obtained from glasshouse crops early in the season, when fruit rot is uncommon, seed is not a very important source of infection, but careful selection is advisable when seed is saved from outdoor plants because of the prevalence of fruit rot on them [24, p. 480]. Observations confirmed the view that the disease is worse in cool, wet weather [11, p. 809; 24, p. 90].

For control [19, p. 501; 28, p. 493], treatment of steamed soil with 0·006 per cent. ethyl mercury phosphate (1 gal. per sq. yd.) [28, p. 254] is recommended for the first application and ½ gal. per sq. yd. is of value in preventing spread after the disease has appeared.

Hutton (E. M.) & Peak (A. R.). **Spotted-wilt development in resistant and susceptible Lycopersicon species.**—*Aust. J. agric. Res.*, 4, 2, pp. 160–167, 2 pl., 1953.

In studies at the Division of Plant Industry, Canberra, of the development of tomato spotted wilt virus [*R.A.M.*, 30, p. 492; 32, p. 648] in the inoculated leaves and uninoculated parts of *Lycopersicon pimpinellifolium* (Porter's strain), *L. peruvianum*, and Rey de los Tempranos tomato, all three hosts at 60° to 87° F. displayed different degrees of resistance to virus multiplication, as compared with the susceptible Bonny Best. Infected plants of Porter's strain and Rey de los Tempranos were able to produce new growth free from virus. Resistance appeared to depend on the presence of a virus-inactivating system which functioned most actively when the plants were maintained at 90°. Although the resistance of Porter's strain can be transmitted to hybrids, Rey de los Tempranos appears more promising as a parent for the development of resistant varieties. It is suggested that the inoculation of hybrid progenies with the ring spot strain [31, p. 451] at a constant temperature of 90° may facilitate the selection of resistant phenotypes.

Beckman (C. H.), Kuntz (J. E.), & Riker (A. J.). **The growth of the Oak wilt fungus with various vitamins and carbon and nitrogen sources.**—*Phytopathology*, 43, 8, pp. 441–447, 11 graphs, 1953.

At the Department of Plant Pathology, University of Wisconsin, the oak wilt fungus (*Chalara quercina*) [*R.A.M.*, 33, p. 124 and next abstract] grew best in liquid media buffered with 12 gm. mono- and dipotassium phosphate in such proportions as to give a pH of 4 to 5. Growth was improved by the addition of a minor element solution and slightly promoted by a mixture of biotin, thiamine, and inositol [cf. 31, p. 357].

The most productive sources of carbon were dextrin and xylose, but good growth was obtained with dextrose, laevulose, galactose, mannose, cellobiose, maltose, sucrose, raffinose, and xylan; on pectin and arabinose development was reasonably good, but rhamnose, lactose, melibiose, cellulose, inulin, and starch gave poor results. Of nine alcohols and nine organic acids, ethanol and malic acid supported fair growth at low concentrations.

The best of 25 nitrogen sources was arginine but asparagine and aspartic acid were good. Development in the presence of alanine, urea, methionine, and ammonium salts was fair; phenylalanine [32, p. 701], glycine, and histidine permitted sparse growth; and nitrate salts, isoleucine, threonine, hydroxypyroline, tryptophane, tyrosine, cystine, cysteine, lysine, and leucine very little or none.

The production of pectinase in culture appeared to be important in relation to the development of tyloses and subsequent wilt.

Beckman (C. H.), Kuntz (J. E.), Riker (A. J.), & Berbee (J. G.). **Host responses associated with the development of Oak wilt.**—*Phytopathology*, 43, 8, pp. 448–454, 1 fig., 1 diag., 1 graph, 1953.

In further studies on oak wilt (*Chalara quercina*) at the University of Wisconsin [see preceding abstract], a sudden drop in the rate of movement of radio-active rubidium in the transpiration streams of inoculated pin oaks (*Quercus ellipsoidalis*) was observed during a period of three to four days preceding the first permanent wilt symptoms. It was accompanied by a fall, similar in time and extent, in the flow of water through twig cuttings. Alternate wilting during the day and recovery at night frequently occurred during the period of low water conductivity before the onset of permanent wilt.

Preliminary histological examinations revealed a considerable number of tyloses in diseased but not in healthy material. Their development was not induced in non-inoculated trees by artificial interruption of the transpiration stream through defoliation, but they did form in inoculated oaks similarly treated. These observations are interpreted as indicating that tylose formation is a response of the host to some action of the pathogen and the cause, rather than the result, of the reduced transpiration stream. It is further deduced that the development of the fungus and of any significant metabolites is not dependent on the foliage.

A mechanical reduction of the water-carrying capacity of the xylem comparable with that associated with infection by *C. quercina* was apparently capable of inducing wilt and death of the trees.

Sy (M.) & Thielicke (W.). **Weitere Bekämpfungsversuche gegen Eichenmehltau.** [Further control experiments against Oak mildew.]—*Forst u. Holz*, 8, 11, pp. 151–153, 1953.

Further experiments in 1952 on the control of oak mildew [*Microsphaera alphitoides*] in Germany corroborated the results of an earlier series [*R.A.M.*, 32, p. 348]. The appreciable improvement effected by even two applications of 0·4 per cent. cosan was markedly enhanced by raising the number to four, but it is assumed that three would be ample. The fungicide was found to promote the growth of the trees in height as well as girth.

Horner (Ruth M.). **Mycological investigations of Birch in Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 17, 1953.

Pathogenicity tests with *Phomopsis* sp. isolated from yellow birch (*Betula lutea*) [*R.A.M.*, 31, p. 51] and *Melanconium bicolor* from *B. papyrifera* [33, p. 138] on their respective hosts indicate that they do not possess a degree of virulence sufficient to warrant their consideration as a primary cause of the deterioration of birch.

Good (H. M.). **Evidence of fungous successions in decays of Sugar Maple.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 15, 1953.

Corticium vellereum [*R.A.M.*, 32, p. 289] has frequently been isolated from decaying sugar maples [*Acer saccharum*] in Ontario. This fungus typically causes a dark buff decay showing a gradual transition from punky wood to a wide band of deep brown wound gum wood, but in a number of atypical rots from which *C. vellereum* was isolated it was found on sectioning that other fungi had been overgrown and completely suppressed. This suggests that isolation methods alone may be insufficient to diagnose the causal organisms of decays.

Sarejanni (J. A.). **Une maladie du Lentisque cultivé.** [A disease of the cultivated Lentisk.]—*Ann. Inst. phytopath. Benaki*, 6, 1, pp. 19–22, 1952.

The lentisk or mastic trees (*Pistacia lentiscus*), which have been grown in certain

parts of the island of Chio, Greece, for centuries, produce 250,000 to 300,000 kg. mastic annually, mostly for export. The principal disease is a dry wood rot, known locally as 'isca' (or 'esca'), appearing only in the dry season from June to August. It attacks only old trees and progresses slowly. In the first year one secondary branch only is attacked by a form of apoplexy and the leaves wither, but it may not fall until the following spring. The wood at the base is transformed into a spongy, yellowish or pale buff mass which crumbles at the slightest pressure. Other branches may be affected in subsequent years; sometimes the whole tree succumbs. As the trees are not pruned it is assumed that the pathogen gains entry through the wounds made to encourage the flow of mastic.

The causal fungus was identified as *Fomes rimosus* [*R.A.M.*, 12, p. 254; 14, p. 62], believed to be fairly common in eastern Europe, but not hitherto reported on *P. lentiscus*.

Cole (J. R.). **Diseases causing partial or total losses of Pecan trees or nuts in the southeastern States where no control measures are employed.**—*Plant Dis. Reptr*, 37, 10, p. 510, 1953. [Multilithed.]

Pecan scab (*Cladosporium effusum*) [*R.A.M.*, 32, p. 704] was very severe in the southern United States in 1953, causing losses of some 5,000,000 to 10,000,000 lb. of nuts on susceptible varieties. Defoliation was so early that no crop is likely to set in 1954. Four or more sprays with Bordeaux mixture (6:2:100), zerlate, or dithane Z-78, the last two at 2:100 plus one quart of summer oil emulsion, gave satisfactory control of scab and pink rot (*Cephalothecium roseum*), which was present on many scabbed nuts and may cause severe losses. The same schedule, or, if there is no scab, the first and second cover sprays only, are effective against downy spot (*Mycosphaerella caryigena*) [22, p. 185], leaf blotch (*M. dendroides*) [19, p. 571], brown leaf spot (*Cercospora fusca*) [loc. cit.], and powdery mildew (*Microsphaera alni*) [11, p. 213]. Control measures recommended against crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) [loc. cit.] include the destruction of diseased trees, omission of cultivation near trees where roots would be cut, and the painting of diseased tissues with one part creosote and three parts coal tar annually until the tree recovers.

Rosette (zinc deficiency) [24, p. 344] and leaf scorch are the most important nutritional disorders. No control is as yet known for the latter, but in test plots near Fort Valley, Georgia, in 1952 trees sprayed with Bordeaux mixture had less scorch than the unsprayed, while those sprayed with zerlate or dithane Z-78 had scorched leaves only in the tops.

Converse (R. H.). **Articularia and Microstroma on Pecan in Oklahoma.**—*Plant Dis. Reptr*, 37, 10, pp. 511–512, 1 fig., 1953. [Multilithed.]

Articularia quercina var. *minor* was observed on pecan leaves [*R.A.M.*, 14, p. 408] in the Stillwater area, Oklahoma, in 1951, 1952, and 1953. An additional symptom, the brick-red appearance of lesions on the upper leaf surface of fresh material, was noted. In 1953 catkin blight (*Microstroma juglandis* var. *robustum*) [cf. 32, p. 580] occurred throughout the east-central pecan-growing area of Oklahoma and sporulation was observed on some necrotic leaflets, infection being confined to the tips, larger veins, and adjoining tissue. Spores on the catkins and leaves had similar dimensions.

Davidson (R. W.). **Two common lumber-staining fungi in the western United States.**—*Mycologia*, 45, 4, pp. 579–586, 3 figs., 1953.

Ophiostoma [*Ceratocystis*] *piceae* [cf. *R.A.M.*, 30, p. 289; 31, p. 464, *et passim*] is commonly present on Douglas fir [*Pseudotsuga taxifolia*] sapwood and several

other coniferous woods in Oregon and Washington, usually on wood with no conspicuous stain or stained by other fungi. In pure culture the *Graphium* state develops rapidly, conidia arising directly on the hyphae. On malt agar the cultures may become dark grey or dark brown, but they often remain light grey to light brown. After some weeks the perithecia may begin to develop slowly.

A species very similar to *Endoconidiophora* [*C.*] *coerulescens* [cf. 29, p. 596; 31, p. 464, *et passim*], found in the central region of the Rocky Mountains and apparently confined to Douglas fir, covers the sapwood with a black surface growth of mycelium and stains the wood below it light to dark grey. At 22° to 25° C. both this fungus and *C. coerulescens* from Europe had a characteristic banana-oil odour, but the European strain grew much faster. Morphologically the two are similar, the only differences being that the Douglas fir fungus has two types of conidiophore, one tapering to a narrow apex and the other enlarging to the apex, and the conidia are slightly smaller in diameter. On these grounds and host specificity the fungus is considered to be a new form, and is named *E. coerulescens* f. *douglasii*.

LINDGREN (R. M.). **Deterioration losses in stored Southern Pine pulpwood.**—*T.A.P.P.I.*, 36, 6, pp. 260–264, 1953.

In studies covering the period from 1948 to 1951 in Mississippi, Louisiana, and Arkansas, losses in specific gravity of rough southern pine [*Pinus taeda* and *P. caribaea*] pulpwood, largely due to decay by *Peniophora gigantea* [*R.A.M.*, 32, p. 53] after two, four, and six months of summer storage (15th April to 15th October) ranged from 2 to 4, 6 to 8, and 8 to 10 per cent., respectively, the corresponding figures for the winter being 0+ to 1·5, 1·5 to 3, and 3 to 5 per cent., respectively. Peeled wood deteriorated most rapidly during the first months of storage, irrespective of season; for two or three months the losses often exceeded those in rough wood, but later they became progressively smaller. The results of pulping trials by the U.S. Forest Products Laboratory revealed little change in the chemical composition of stored wood. Measurable effects on sulphate pulp strength were indicated for pulpwood stored longer than two months in summer and five in winter. The principal change in groundwood was a decrease in brightness. Factors contributing to low storage losses in rough wood [loc. cit.] were tight piling and fungicidal spraying [32, p. 527] and in peeled wood barking as soon as possible after cutting, winter storage, and fungicidal treatment of entire bolts.

HUBERT (E. E.). **Aids in the isolation of fungi from woody tissues.**—*Phytopathology*, 43, 7, pp. 403–404, 1 fig., 1953.

An equipment that has proved useful for making large numbers of isolations from infected wood samples at the Idaho School of Forestry consists of a metal 'C' clamp with a jaw space of or exceeding 3 in., which is bolted to a board in a tilted position to raise the jaws above the surface of the board. A metal guard prevents the board from slipping. Sample blocks about 3 in. in length are washed to remove dust and spores, dipped for a moment in boiling water, and split open with a sterilized blade. The piece selected for isolations is fixed in the clamp and fragments about ½ in. long are prised up with sterile chisel forceps and pressed half way into the agar medium.

HUDSON (M. S.). **Solvent recovery from pentachlorophenol-treated wood.**—*Industr. Engng Chem.* (*Industr.*), 45, 7, pp. 1576–1583, 4 figs., 1 diag., 3 graphs, 1953.

When wood is pressure-treated with pentachlorophenol in volatile solvents, most of the chemical is brought to the surface by evaporation of the solvent, leaving objectionable deposits which interfere with painting. The results of experi-

mental studies at the Taylor-Colquitt Co., Spartanburg, South Carolina, on Douglas fir [*Pseudotsuga taxifolia*] and southern yellow pine [*Pinus* spp.] demonstrated the practicability of recovering most of the solvent by the use of a modification of the vapour drying process (*Proc. For. Prod. Res. Soc.*, 1, p. 124, 1947) [*R.A.M.*, 30, p. 499]. As a rule 6 to 10 lb. per cu. ft. of solution containing 5 per cent. pentachlorophenol is required for pressure impregnation. The cost of the solvent ranges from $12 to $18 per 1,000 board ft. compared with only $5 to $9 for the pentachlorophenol itself. By means of the vapour process the solvent can be recovered at a cost of $6 to $8 per 1,000 board ft., representing a decided economic advantage and resulting in an attractive finished product.

Rennerfelt (E.) & Paris (Sheila K.). **Some physiological and ecological experiments with Polyporus annosus Fr.**—*Oikos*, 4, 1, pp. 58–76, 8 figs., 1953.

In an investigation at the Forest Research Institute, Stockholm, of some of the growth requirements of *Polyporus* [*Fomes*] *annosus* [*R.A.M.*, 33, p. 190] it was shown that the fungus was unable to grow without the addition of 0·002 to 1γ vitamin B_1 per 25 ml. synthetic nutrient solution. The addition of certain soil extracts promoted higher rates of growth than the vitamin. Growth takes place between pH 2·9 and 7 and between 2° and 32° C.

In cultural studies the mycelium of *F. annosus* at 12° overgrew the mycelia of *Phoma suecica*, *Polyporus borealis*, *P. frondosus* and *Trichoderma viride*, but at 22° C. *T. viride* overgrew *F. annosus* [cf. 32, p. 498], *P. borealis* was inhibitory, and *P. frondosus* was not overgrown. Thus the ability of *F. annosus* to counteract other organisms at low temperatures probably influences its natural incidence. Extracts from pine needles on which *F. annosus* had been growing inhibited the growth of *P. frondosus*, *P.* [*Polystictus*] *abietinus*, and *Ophiostoma pini*.

Walker (J. C.). **Disease resistance in the vegetable crops. II.**—*Bot. Rev.*, 19, 10, pp. 606–643, 1953.

This review is an appendix to that published under the same title in 1941 [*R.A.M.*, 21, p. 59] and follows the same plan. It includes a bibliography of 266 titles.

Pound (G. S.) & Walker (J. C.). **Autogenous necrosis of Cabbage.**—*Phytopathology*, 43, 8, pp. 415–418, 2 figs., 1953.

In 1946 certain inbred lines of cabbage inoculated with the cabbage mosaic virus complex (cauliflower and turnip mosaic viruses) at the Wisconsin Agricultural Experiment Station developed a severe, progressive necrosis at or after mid-season. It was believed to be part of the virus syndrome until the next year, when uninfected plants of the same lines displayed the same symptoms, consisting of either necrotic spots on the leaves, followed by breakdown of the heart tissue, or intensive necrosis of the petiole bases culminating in defoliation. The condition was shown to be of genetic origin, the expression of the disorder being completely recessive and controlled by a number of genes, separate groups being concerned in the production of petiole necrosis and leaf spotting. When seedlings of necrotic lines were grown under controlled temperatures in the greenhouse, typical symptoms developed at 16° and 20° C. but not after 120 days at 24° and 28° [cf. *R.A.M.*, 31, p. 466].

Cormack (M. W.) & Harper (F. R.). **Root diseases of Sugar Beets in Alberta.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 15, 1953.

Seedling blight or black root of sugar beets [*R.A.M.*, 33, p. 195] is widespread in the irrigated districts of southern Alberta. *Phoma betae* predominated among the isolates from diseased seedlings each year, while *Pythium ultimum* and *Aphanomyces cochlioides* [loc. cit.] occurred mainly in wet seasons and low-lying areas.

Root rot of mature beets occurred commonly only in 1949. High humidity during storage decreased the damage caused by *Phoma betae* but favoured infection by *Pythium ultimum*.

Coons (G. H.). **Resistance of Sugar Beets to virus yellows.**—Abs. in *Phytopathology*, 43, 7, p. 405, 1953.

In June, 1952, the following inbred sugar beets subjected to intensive infection by beet yellows virus [*R.A.M.*, 33, p. 194] in an experimental planting at Salem, Oregon, remained virtually free from the disease: U.S. 201–B (resistant to leaf spot [*Cercospora beticola*: loc. cit.]) and NB 6–56, SL 0502, SL 0504, and SL 8255, all resistant to curly top [virus: loc. cit.]. The incidence of yellows virus in U.S. 216 was about 25 per cent., while in other selections and a number of commercial varieties it ranged from 75 to 100 per cent. Plantings at Salinas, California, of the four lines resistant to curly top, gave readings for yellows virus agreeing with the Oregon results.

Hull (R.). **Assessments of losses in Sugar Beet due to virus yellows in Great Britain, 1942–52.**—*Plant Path.*, 2, 2, pp. 39–43, 12 graphs, 2 maps, 1953.

Records of the incidence of yellows virus in sugar beet [*R.A.M.*, 33, p. 130 and next abstract] have been made annually since 1942 as part of a survey of sugar-beet diseases in Great Britain conducted by the British Sugar Corporation and organized from Dunholme Field Station, near Lincoln. Each fieldman, whose area contains 1,000 to 4,000 acres of sugar beet, counts diseased plants in one field of about ten acres at the end of each month from May to September. The number of fields sampled annually varies from 135 to 155. The distribution of the sample fields corresponds roughly with the density of the crop in the different parts of the country. The number of plants with yellows is counted in ten samples of 100 plants spaced at equal intervals along the diagonals of the field. As yield loss is directly proportional to the length of time a plant is infected [loc. cit.], periodical counts of the number of infected plants in a crop give a measure of the severity of infection.

To check the accuracy of the results, incidence is estimated independently at the end of August by factory agriculturists who assess the acreages with infection ratings of under 1 per cent., 1 to 20 per cent., 21 to 60 per cent., and 61 to 100 per cent. The mean percentage infection is then calculated for each factory area by taking the mean percentage infection of the acreage in the four categories above to be, respectively, 1 per cent., 10 per cent., 40 per cent., and 80 per cent. The mean infection over the whole country is calculated in the same way from the sum of the acreages falling in each category in all areas as a proportion of the total acreage for the country. The results agreed reasonably well with those obtained from the sample field counts, the acreage estimates for the years 1946 to 1952 being, respectively, 7·1, 12·5, 17·5, 46·1, 16·2, 5·6, and 25·1 per cent. infection, the corresponding sample field counts giving 6, 9·5, 17·9, 47·6, 13·7, 3·5, and 22 per cent.

The loss caused by the disease on artificially infected experimental plots is 4 to 5 per cent. of the sugar yields for every week during which the plants display yellows symptoms up to harvest. The result is used in conjunction with the sample field counts to assess the annual loss caused by the disease. The length of time the plants have been infected is taken as the number of weeks between the observation date and mid-October. The increase in percentage count at the end of each month from June over that of the previous count is taken as the proportion of plants showing symptoms for 15, 11, 7, and 2 weeks, respectively. The product of the proportion of freshly infected plants for each month and the number of weeks to harvest is then multiplied by 4 to 5 per cent. to give the percentage loss of sugar yield for the infections developing during that month, and these are added to give the total percentage loss. The check method adopted is to calculate a regression

of each factory's annual sugar yield (product of mean yield of roots and mean sugar percentage, as recorded by the British Sugar Corporation) on the mean virus yellows infection at the end of August, assessed from the estimate of the acreage infected. This regression coefficient is highly significant and shows a sugar loss of 2½ cwt. per acre for every 10 per cent. of yellows infection recorded at the end of August. If the possible effects of drought and late sowing are eliminated by calculating a multiple regression of sugar yield on rainfall during the cropping season, mean sowing date, and virus yellows infection the regression coefficient for infection is very little changed. Numerous experiments have confirmed the observation that plots yellowed in July yield about half as much sugar as those that are still healthy when harvested. This may be compared with the calculated loss of 49·5 per cent. for infected plants counted at the end of July, assuming 4·5 per cent. loss of sugar yield for each week of infection.

Hull (R.). **Assessment of disease incidence in the Sugar-Beet crop.**—*Ann. appl. Biol.*, 40, 3, pp. 603–606, 1953.

In this paper, read before the Association of Applied Biologists in London on 27th February, 1953, the author describes the methods used in Great Britain to assess the incidence of sugar beet diseases [*R.A.M.*, 29, p. 240]. Seedling troubles are difficult to diagnose, but it is usually possible to decide whether losses are due to soil acidity, fungal infection, insect injury, 'strangles' [loc. cit.], or adverse weather. At the end of June fieldmen report to the Sugar Corporation the acreage of beet lost or re-sown, and estimate the acreage on which the stand has fallen below 75 per cent. as a result of each of these troubles. With present methods of cultivation seedling diseases do not cause serious loss.

Acreage estimates are also obtained for the incidence of diseases due to deficiency of trace elements. These are recorded as low (up to 20 per cent.), moderate (21 to 60 per cent.), and high (61 to 100 per cent.). Less than 400 acres are severely affected by boron deficiency, though the area lightly affected varies seasonally from 700 to 8,000 acres. Manganese deficiency is reported to be high on up to 1,000 acres. Magnesium deficiency tends to be high in years of light virus yellows attack.

Root diseases were surveyed by examining washed samples of roots from each load of beets arriving at the factories, but this survey has been discontinued.

Incidence of common foliage diseases is assessed by counting diseased plants in sample fields. Only two diseases so counted, downy mildew [*Peronospora schachtii*: 30, p. 306] and virus yellows [see preceding abstract], are of economic importance.

Under the existing scheme for certifying stecklings [32, p. 295] sample plots of all commercial steckling beds are planted each year at Dunholme, Lincoln, for observation. During the two seasons that the scheme has been in operation the mean virus yellows infection in the crops for harvesting in 1951 and 1952 was only 0·7 per cent.

Vasudeva (R. S.) & Govindaswamy (C. V.). **Studies on the effect of associated soil microflora on Fusarium udum Butl., the fungus causing wilt of Pigeon-Pea (Cajanus cajan (L.) Millsp.), with special reference to its pathogenicity.**—*Ann. appl. Biol.*, 40, 3, pp. 573–583, 1953.

In further studies at the Indian Agricultural Research Institute, New Delhi, experiments were made to obtain more information on the interaction between *Fusarium udum* [*R.A.M.*, 32, p. 544] and saprophytic soil fungi associated with wilt disease. When the isolates were tested separately only the filtrate of *Aspergillus niger* [29, p. 624] inhibited the growth of *F. udum*. *A. terreus* and *Rhizopus nigricans* [*R. stolonifer*: 32, p. 544] checked growth slightly, while *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *Cunninghamella elegans* [loc. cit.] had no inhibitory effect. Marked inhibition resulted from a combination of all the fungal isolates,

and maximum inhibition was obtained with the same combination plus *Bacillus subtilis* strain A [31, p. 609; cf. 33, p. 105].

As differences in inhibition were obviously due to differences in concentration of the filtrates, tests were made with 7 ml. of each filtrate separately and also at concentrations of 10 to 70 per cent. The growth of *F. udum* was checked markedly by its own filtrate at all concentrations except 10 per cent., while *A. niger* filtrate at 50 per cent. and *Rhizopus stolonifer* at 70 per cent. inhibited it completely. A direct correlation was apparent between concentration of some of the filtrates and growth of *F. udum*.

The pH of the *A. niger* filtrate fell to 1·72 and that of *R. stolonifer* to 2·49, and this altered pH was responsible for the inhibition. After passage through soil the pH of the filtrates changed from a range of 1·8 to 3 to about 5 to 5·6 or 7, according to the soil, and the inhibitory effect was almost lost.

Growth rate tests showed that only *R. stolonifer* might be effective in reducing incidence of wilt because of its faster growth rate (average linear growth on soil-maize 180 mm. in three weeks, as against 58·5 mm. for *F. udum*). In soil inoculation experiments on potted seedlings of the very susceptible I.P.69 *A. terreus* appeared to increase the virulence of *F. udum*. Mixed inocula and mixed filtrates of all the other organisms reduced wilt incidence.

Brewer (D.). **Variation in Ascochyta pisi Lib.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 14, 1953.

In work in the Department of Botany, Ontario Agricultural College, Guelph, inoculation to pea with isolates of *Ascochyta pisi* indicated the presence of races which differ in pathogenicity [*R.A.M.*, 33, p. 139]. Cultural studies showed that the various isolates fall into related groups on the basis of their growth habit and developmental rhythm. For the most part these cultural relationships may be equated with pathogenic behaviour on different hosts. Concomitant cytological investigations indicated that the variants of *A. pisi* have probably arisen through mutation.

Hyre (R. A.) & Cox (H. S.). **Factors affecting viability and growth of Phytophthora phaseoli.**—*Phytopathology*, 43, 8, pp. 419–425, 1 fig., 6 graphs, 1953.

At the Delaware Agricultural Experiment Station the maximum radial growth in oat agar cultures of *Phytophthora phaseoli*, the most destructive pathogen of Lima beans [*Phaseolus lunatus*] in the State [*R.A.M.*, 31, p. 44], occurred at 20° C., while at 15° development was almost equally profuse. No growth was observed at 5° and 30°, a fortnight's exposure at 30° being apparently lethal. The mean lengths of the sporangia varied from 31·2 to 38·6 μ according to the medium and the temperature. At 20° nearly 40 per cent. of the sporangia were viable after 27 hours at 95 or 100 per cent. relative humidity and 25 per cent. after 50 hours. After four hours at 90 per cent. relative humidity, one hour at 86, or 15 minutes at 81, less than 10 per cent. were viable. At 30° fewer than 10 per cent. germinated after 27 hours at 100 per cent. relative humidity, 10 at 97, or two at 93. Of various concentrations of sucrose only 10 per cent. seriously reduced germination, while dilute sodium chloride was toxic to the sporangia of both *Phytophthora phaseoli* and *P. infestans*. Free water is essential to sporangial germination in the former species. Direct germination seldom exceeded 4 per cent. and averaged about 1 per cent. at 25°. At optimum temperatures indirect germination began within 30 minutes and was virtually completed in three hours, the average percentages at 10°, 15°, 20° 25°, and 30° being 84, 80, 13, 1, and 0, respectively.

Owing to disintegration, germination of the zoospores of *P. phaseoli* in rain water was under 30 per cent. Disintegration in sugar solutions decreased with increasing concentration up to 4 per cent. No disintegration of *P. infestans* zoo-

spores occurred in rain water or sucrose. Germination in *P. phaseoli* rose to over 90 per cent. in 4 and 5 per cent. sucrose solutions. Some zoospores were motile for at least 24 hours at 10°, for 12 hours at 15°, six at 20°, and less than three at 25° and 30°. The rates of zoospore germination and germ-tube elongation increased as the temperature rose up to 25° and then declined at 30°. After 24 hours at 10°, 15°, 20°, 25°, and 30° the germination percentages were 16, 77, 87, 83, and 84 and the average germ-tube lengths (in μ) 62, 72, 99, 114, and 19, respectively. Single zoospore isolates produced oospores in culture, thereby demonstrating homothallism for *P. phaseoli*. Their numbers increased with rising temperatures and were higher on Lima bean than on oat agar.

Lehman (S. G.). **Race 4 of the Soybean downy mildew fungus.**—*Phytopathology*, 43, 8, pp. 460–461, 1953.

A brief account of this work in North Carolina on physiologic race 4 of *Peronospora manshurica*, the agent of soy-bean downy mildew, has already been noticed [*R.A.M.*, 33, p. 133]. The disease ratings assigned to the new race in a second test on 26th May, 1952, were uniformly lower than those given in the first (12th April), presumably because it was impracticable to maintain sufficiently low temperatures for the abundant production of conidial inoculum. N49–2560 (S100 × CNS), used only in the second trial, reacted similarly to Roanoke and Rokusun.

Hildebrand (A. A.). **Studies on stem canker and pod and stem blight of Soybeans in Ontario caused by Diaporthe species.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 16, 1953.

The information on stem canker of soy-beans caused by *Diaporthe phaseolorum* var. *batatatis* [*R.A.M.*, 32, p. 665 and next abstract] has already been noted from another source [32, p. 165].

Towards the end of the season a pod and stem blight is sometimes found on soy-beans in Ontario, characterized by aggregations of minute black spots which are either pycnidia or stromatal precursors of pycnidia. Eleven isolates of *Phomopsis* have been obtained from these bodies, not all of which are identical morphologically or pathogenically. They were considered as possibly representing the imperfect state of *Diaporthe phaseolorum* var. *sojae*, but all attempts to induce them to form a perfect state have so far been unsuccessful.

Hildebrand (A. A.). **Some aspects of Soybean diseases in Ontario.**—*Soybean Dig.*, 13, 9, pp. 18–20, 2 figs., 1953.

In general, soy-bean diseases throughout the high-production area of south-western Ontario, Canada, were less severe in 1952 than for several years past. Even stem canker [*Diaporthe phaseolorum* var. *batatatis*: see preceding abstract] was relatively mild. On highly fertile soils, however, the moderately susceptible Lincoln variety sustained heavy damage. In three locations (one in Kent and two in Essex County) where observations were made, Harman and Harosoy were the least and Hawkeye and Blackhawk the most susceptible. The loss from stem canker is estimated at about 4 per cent. ($450,000), i.e., roughly half that incurred in the three preceding seasons.

Sarejanni (J. A.). **Le Phytophthora des Aubergines en Grèce.** [The *Phytophthora* of Eggplants in Greece.]—*Ann. Inst. phytopath. Benaki*, 6, 1, pp. 14–18, 1952.

A disease of eggplants caused by *Phytophthora parasitica* var. *macrospora* [cf. *R.A.M.*, 30, p. 433] has been observed since 1939 in Attica and several other parts of Greece, notably the islands in the Aegean. It causes damping-off in the seed bed and in the field appears in three distinct forms, viz., a local spotting on the lower

leaf surface, a fruit rot which has been known to cause losses of over 60 per cent. in Kiphissia, and a slow, progressive, general withering, usually marked by a collar lesion. This last is the most serious manifestation and may account for more than 80 per cent. of the crop.

Field infection appears to originate (*a*) from the seed bed, becoming apparent only after transplanting and when environmental conditions are favourable, (*b*) from irrigation water which often flows for long distances in open country, and (*c*) from infection foci in the same field.

Control consists in replanting the seed bed if any trace of disease appears, first disinfecting the soil and then spraying the new seedlings with Bordeaux mixture containing 0·5 per cent. copper sulphate. In the field diseased plants should be destroyed. Irrigation water may be disinfected by putting a bag containing about 1 kg. copper sulphate in the principal channel, changing the bag after an interval of 8 to 10 days [cf. 33, p. 230]. In fields where the disease is already established a three-year rotation, at least, is recommended.

Johnson (S. P.). **Some factors in the control of the southern blight organism, Sclerotium rolfsii.**—*Phytopathology*, 43, 7, pp. 363–368, 1 fig., 3 graphs, 1953.

An exploratory investigation was carried out at Texas Agricultural Experiment Station of some nutritional and physiological factors in relation to the control of *Sclerotium rolfsii* [*R.A.M.*, 33, p. 185], using as inoculum cultures of a watermelon isolate grown on watersoaked, autoclaved oats. No adverse effects on the development of the pathogen in a synthetic nutrient solution were observed in the presence of ammonium nitrate, sodium nitrate, ammonium sulphate, and calcium chloride at levels of 16,000, 16,000, 36,000, and 3,000 p.p.m., respectively [cf. 7, p. 193; 21, p. 399], whereas sodium nitrite was toxic in amounts exceeding 20 p.p.m. and suppressed growth completely at 400.

Lucerne meal was mixed with Lufkin sandy loam soil in pots in proportions ranging from 0·4 to 4 per cent. by weight and equal quantities of sclerotia were added to each. Total disorganization of the sclerotia was accomplished in six weeks at 4 per cent. soil-meal and in eight at 2 per cent., compared with 90 per cent. disorganization at 1 and 0·4 per cent. after 12 weeks and only 25 per cent. in the unamended soil in the same time. Although viable sclerotia were not present, groundnut seedlings in the 2 and 4 per cent. mixtures contracted infection by *S. rolfsii* [32, p. 300], obviously caused by residual fragments of mycelium [6, p. 439; 30, p. 447].

The existence of antagonism to *S. rolfsii* among the microflora of Lufkin soil was demonstrated, but the addition of organic matter (lucerne meal in these experiments) was essential to its active manifestation.

McKeen (C. D.). **A black rot disease of greenhouse Cucumbers in south-western Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, pp. 18–19, 1953.

In 1950 a serious outbreak of fruit rot and stem canker of cucumbers occurred in a single greenhouse at Leamington, Ontario. Lesions developing at the nodes girdled the stems, ultimately causing wilt and death of many plants. Pycnidia of the *Phomopsis* type developed in abundance on most lesions, producing both alpha and beta spores. Perithecia were observed occasionally on naturally infected stems but so far cultural studies have failed to reveal any connexion between the two forms. This appears to be a previously undescribed pathogen of cucumbers.

McKeen (C. D.). **Tobacco etch on Peppers in southwestern Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 19, 1953.

During the summers of 1950 and 1951, sweet pepper [chilli] in south-western Ontario was affected by a disease with prominent symptoms of concentric ring

pattern on foliage and fruits, often accompanied by necrosis. Later in the season young leaves on affected plants were distorted, rugose, and chlorotic, with dark green blotching and vein-banding. Inoculation tests on tobacco and other hosts showed that tobacco etch virus [*R.A.M.*, 31, p. 520; 32, p. 7], sometimes in conjunction with cucumber mosaic virus [cf. 33, p. 201], was responsible.

Singh (R. S.). **Efficiency of Bordeaux mixture and perenox in controlling leaf spot of Bhindi.**—*Sci. & Cult.*, 19, 6, pp. 305–306, 1953.

In the 1948–9 season three sprayings with Bordeaux mixture (4–4–50) or 0·3 per cent. perenox eliminated infection of *Hibiscus esculentus* by *Phyllosticta* sp. and *Cercospora hibisci* [*R.A.M.*, 30, p. 389], and with the latter fungicide by *Alternaria* sp. also, in experiments at the Plant Pathology Laboratory, Kanpur, India, the percentages of infection on the unsprayed being 58, 69·3, and 80 for the three pathogens, respectively. The crops sprayed with perenox gave the best cash returns.

Zobrist (L.), Clausen (R.), & Mühlethaler (P.). **Rebspritzung mit Helikopter—Der erste Versuch in der Schweiz.** [Vine spraying by helicopter—the first experiment in Switzerland.]—*Schweiz. Z. Obst- u. Weinb.*, 62, 13, pp. 246–248, 1 fig., 1953.

It appears from the results of spraying from a Hiller 360 helicopter [cf. *R.A.M.*, 32, p. 138] against vine downy mildew [*Plasmopara viticola*] in Switzerland that this expeditious method may be applied with advantage for up to three treatments. To ensure a uniform coverage of fine, punctiform droplets, the area must be traversed twice, lengthwise and diagonally or in curves, using 140 l. per ha. of a 6 to 8 per cent. cuprosan mixture. The time required for the treatment of 1 ha. is four to five minutes and the cost is not unduly high.

Boubals (D.) & Vergnes (A.). **Essais de fongicides organiques dans la lutte contre le mildiou de la Vigne.** [Tests with organic fungicides in the control of Vine mildew.]—*Progr. agric. vitic.*, 139, 5–6, pp. 64–69; 7–8, pp. 90–97, 1 pl. (loose), 3 figs., 3 graphs, 3 diags., 1953.

In a comparative spraying test carried out near Montpellier, France, in 1952 Aramon vines were sprayed against *Plasmopara viticola* [see next abstract] on eight occasions with Bordeaux mixture (0·5, 1, 2, and 4 kg. copper sulphate per 100 l.), a captan-containing product S (0·25, 0·5, 1, and 2 kg.), and zineb-containing D (0·15, 0·3, 0·6, and 0·9 kg.). The average numbers of foliage lesions per vine at the end of August for these treatments, respectively, were: 815, 368·33, 203·33, 270·66; 117, 95·66, 27·33, 19·33; and 525, 175, 75·66, and 38·66. The corresponding yields were: 1·46, 2·71, 3·65, 3·94; 5·42, 5·22, 5·64, 5·78; and 2·59, 2·93, 3·39, and 4·06 kg.

The fungicidal effect of S was superior to that of Bordeaux mixture; it gave effective protection to the fruit clusters, which was about as good at the 250 gm. rate as at 2 kg. The best rates of application for protecting yields and reducing foliage infection were 250 and 500 gm. The fungicidal effect of D resembled that of Bordeaux mixture; at 300 gm. it had the same effect as 2 per cent. of the latter but it was not any more effective at the higher rates except in protecting the foliage.

[This paper appears in a slightly expanded form in *Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 4, 2, pp. 209–225, 7 figs., 3 graphs, 3 diags., 1953.]

Gaudineau (M[arguerite]) & Messiaen (C. M.). **Mildiou de la Vigne et nouveaux produits de lutte.** [Vine mildew and new control materials.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 4, 2, pp. 185–208, 8 graphs, 1953.

This paper describing comparative spraying tests against vine mildew [*Plasmopara viticola*: see preceding abstract] recapitulates information on epiphytotics

from 1947 to 1952 in France and gives a detailed report, already noticed from another source [*R.A.M.*, 32, p. 361], of work carried out during 1951 with Bordeaux mixture and other materials.

In 1952 five applications were given of 2 per cent. Bordeaux mixture (used as a standard of comparison, at 2 kg. per hl.), organic copper P (500 gm. per hl)., zineb (300 gm. per hl.), 1 per cent. Bordeaux (1 kg. per hl.), captan, nascent copper oxide, and ziram (all at 500 gm. per hl.), and ferbam (300 gm. per hl.). The comparative weights of leaves per vine at the end of the season, taking 2 per cent. Bordeaux as 100, were 118, 99, 98, 96, 81, 64, and 61. It is concluded that with an adequate number of applications 0·3 per cent. zineb and 0·5 per cent. captan give good protection against *P. viticola*. The organic copper compound P merits further tests.

In small-scale tests 1 per cent. copper oxychloride (two brands) and 2 per cent. and 0·5 per cent. Bordeaux all gave satisfactory results, the ratings, taking 2 per cent. Bordeaux as 100, being 105·6, 100·3, 100, and 99·1, respectively, with 2·2 for the unprotected.

Matthews (R. E. F.). **Factors affecting the production of local lesions by plant viruses. II. Some effect of light, darkness, and temperature.**—*Ann. appl. Biol.*, 40, 3, pp. 556–565, 3 graphs, 1953.

In further investigations in this series at the Plant Diseases Division, Auckland, New Zealand [*R.A.M.*, 33, p. 204], Sydney Wonder potted bean plants [*Phaseolus vulgaris*], inoculated with tobacco necrosis virus, were kept in the dark at different temperatures for one hour both before and after inoculation. The number of lesions increased with temperature over the range 55° to 82° F. The effect of 30-minute periods of darkness before or after inoculation depended on the time of day, the number of local lesions usually being decreased. Extending the period of darkness before inoculation occasionally increased the number of lesions.

Light appeared to be more important than temperature in controlling the daily variation in susceptibility. In a test continued over a period of 30 hours this variation persisted even when the plants were placed under constant conditions before and after inoculation. When plants previously kept in darkness were exposed to light of about 800 foot candles for one minute immediately before inoculation the number of local lesions was doubled.

The evidence obtained suggests that the daily fluctuation due to alternating light and dark may continue for a time after the varying conditions have been eliminated. If light is the main cause of this fluctuation, continuance of light at a low level may reduce the daily change in susceptibility more effectively than darkness. This variability will affect the results of experiments carried out at different times on the same day or at the same time on different days.

Orders issued by the Royal Danish Ministry of Agriculture.—Copenhagen, 53 pp., 1953. [French version.]

This booklet, a translation from the Danish, contains much useful, up-to-date information on plant disease legislation in Denmark. An Order of 27th April, 1953, prohibits the importation of consignments of plants infested by dangerous diseases or pests, including the following: spindle tuber and other potato viroses; peach yellows and other stone fruit viroses; phloem necrosis and other elm viroses; *Rubus* stunt and other viroses of raspberry, blackberry, and other *R.* spp.; yellow edge and other strawberry viroses; stunt and other chrysanthemum viroses; lettuce mosaic virus; Dutch elm disease (*Ophiostoma* [*Ceratostomella*] *ulmi*); oak wilt (*Chalara quercina*); potato wart (*Synchytrium endobioticum*) [*R.A.M.*, 25, p. 96]; red core of strawberry (*Phytophthora fragariae*); and poplar canker (*Septoria musiva*).

The importation is further prohibited, *inter alia*, of all species or varieties of elm, including seed, bark, and unstripped trunks; *Berberis*, all species excluded from cultivation in the country [32, p. 244], grafted plants, and seed of any species; *Prunus americana* and *P. virginiana*; all stone fruit seeds; seed of all oak species; and *Castanea mollissima*, including seed.

Nursery plants (including fruit trees, fruit bushes, and forest plants) for exportation are inspected by the National Committee for the Propagation and Sanitary Inspection of Horticultural Plants on application by the grower. Plants found on field inspection to be infected by virus diseases (except for a few very mild, latent forms), silver leaf (*Stereum purpureum*), *Verticillium* wilt, and *Pseudomonas morsprunorum* and other bacterioses will not be approved for export.

Pflanzenschutzbestimmungen im Ausland. [Foreign plant protection regulations.] —*Amtl. PflSchBestimm.*, N.F., 5, 2, pp. 102–105, 112–120, 1953.

Under the terms of agreements between the Danish and Federal German Governments dated 9th and 10th December, 1952, regulating the import of plants into Denmark, no plants infected with a number of dangerous diseases [see preceding abstract] may be imported. Certain plants are absolutely prohibited [loc. cit.]. The only form of *Pseudotsuga* [*taxifolia*] allowed into Denmark is the one [*viridis*] resistant to *Rhabdocline pseudotsugae* [*R.A.M.*, 32, p. 350].

A Decree of the Swiss Federal Council of 26th September, 1952, provides for the immediate notification to the appropriate local authorities of the detection of any case or suspected case of chestnut blight (*Endothia parasitica*) on Federal territory.

Plant quarantine import restrictions in Indonesia.—*Plant Prot. Bull., New Delhi*, 3, 2, pp. 52–55, 1951.

This summary of the plant quarantine import restrictions in Indonesia [*R.A.M.*, 30, p. 82], extracted from *S.R.A.*, *B.E.P.Q.*, *U.S. Dep. Agric.*, 175, 1950, is for the benefit of nurserymen, plant quarantine officials, and those interested in the export of plants and plant products from India to Indonesia. It includes lists of restricted and unrestricted plants and authorized ports of entry.

Čuturilo (S.). **Štetočine i bolesti biljaka na teritoriji NR Srbije u 1951 godini.** [Plant pests and diseases in the territory of NR of Serbia in 1951.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 11, pp. 21–42, 1952. [English summary.]

Among the diseases observed in Serbia, Yugoslavia, during the 1951 survey [cf. *R.A.M.*, 30, p. 507] conducted by the Phytosanitary Service were: potato blight (*Phytophthora infestans*) [31, p. 349], which caused 60 and 30 per cent. loss in Vojvodina and Čačak, respectively; potato early blight (*Alternaria solani*) [C.M.I. map No. 89]; beet yellows virus [No. 261] and *Rhizoctonia violacea* [*Helicobasidium purpureum*: cf. *R.A.M.*, 31, p. 415] on sugar beet near Beograd, the former also near Jasenice and the latter at Vrbas; tobacco black shank (*Phytophthora* [*parasitica* var.] *nicotianae*) found in nurseries and in the field; tobacco ring spot virus [C.M.I. map No. 144] on tobacco; *Ascochyta pisi* on peas [No. 273]; *Peronospora spinaciae* [*P. effusa*: cf. *R.A.M.*, 8, p. 626; 19, p. 62], causing serious damage on spinach at Kragujevac; *Pseudoperonospora cubensis* [C.M.I. map No. 285] on cantaloupe, cucumber, and pumpkin in Banat, Beograd, and the Župsko-kopaonički district; bean [*Phaseolus vulgaris*] anthracnose (*Colletotrichum lindemuthianum*) [No. 177]; broad bean rust (*Uromyces fabae*) [No. 200; *R.A.M.*, 29, p. 5], responsible for serious losses; cabbage black rot (*Bacterium* [*Xanthomonas*] *campestris*) [C.M.I. map No. 136]; lettuce downy mildew (*Bremia lactucae*) [No. 86]; *Pythium debaryanum* [No. 208] causing damping-off damage in nurseries; cherry witches' broom (*Taphrina cerasi*) [No. 199] at and round Čačak; walnut

bacterial blight (*Bacterium* [*Xanthomonas*] *juglandis*) [No. 133], which was fairly widespread, appearing in epiphytotic form at Zrenjanin; and *Sorosporium reilianum* [*Sphacelotheca reiliana*: No. 69] on maize in Vojvodina. The most serious diseases were plum rust (*Puccinia pruni-spinosae*), which diminished yields by about 20 per cent., beet leaf spot (*Cercospora beticola*) [cf. *R.A.M.*, 33, p. 195], which destroyed 50 per cent. of sugar beet leaves, plum pox [cherry mottle leaf virus: see below, p. 304], responsible for loss of production of 10,000,000 plum trees, and vine powdery and downy mildews (*Uncinula necator* and *Plasmopara viticola*), the former destroying up to 90 per cent. of the fruits in some places and the latter reducing the vintage by 20 per cent.

New and interesting identifications.—*Papua & New Guinea agric. Gaz.*, 8, 2, pp. 72–73, 1953.

Species of *Phyllosticta* attacked the seed crop of kenaf (*Hibiscus cannabinus*) at Kaloki, in 1952 and 1953, infecting the leaves and capsules. *Entyloma oryzae* was isolated from diseased rice plants [*R.A.M.*, 19, p. 301; 24, p. 472] which had been severely damaged in the coastal area at Dylup, between Madang and Bogia, New Guinea. Leaf spotting, observed on three rice varieties at the District Agricultural Station, Madang, was found to be due to a species of *Ramularia*, while *Ustilaginoidea virens* [loc. cit., and 31, p. 458] was found to be responsible for diseased rice heads at Dayna, near Wewak.

The incidence of *Phytophthora colocasiae* on taro [*Colocasia antiquorum*: 27, p. 407] decreased considerably in 1952–3, particularly in the northern part of Buka, one of the Solomon Islands, where there is little evidence of the disease and the crop is being planted extensively again.

Outbreaks and new records.—*F.A.O. Pl. Prot. Bull.*, 1, 7, pp. 106–109, 1953.

I. L. Conners reports that *Erysiphe cichoracearum* on autumn cucumbers under glass in Essex County, Ontario [*R.A.M.*, 32, p. 666], was controlled by spraying with ½ to 1 lb. copper sulphate in 100 gals. water; five applications of iscothan (6 to 8 oz. in 100 gals.) at intervals of five to seven days completely eradicated the fungus.

F. Mujica reports from Chile that Provence lucerne was affected by wilt (*Corynebacterium insidiosum*) [C.M.I. map No. 67] in the Andean zone, where it is believed to be widespread, extending to La Kalera, west of Santiago. Seed of the new resistant variety Caliverde, imported from California, is to be multiplied for distribution to growers.

Epidemics of wheat take-all (*Ophiobolus graminis*) of exceptional severity have occurred in Chile [*R.A.M.*, 23, p. 475] during the last two growing seasons in the Province of Cautin, one of the principal wheat-growing areas, where in 1951–2 the loss was 20,760 metric tons, 15 per cent. of the total production.

Anthracnose (*Colletotrichum lindemuthianum*) [23, p. 254] of beans [*Phaseolus vulgaris*] is serious in a few localities where high atmospheric humidity prevails, such as La Cruz, Quillota, and Limache. Only one race appears to be present, differing from the three recognized elsewhere [cf. 11, p. 618; 33, p. 133]. The Chilean bean varieties, Arroz and Cristal, and the introduced varieties, Red Kidney and Michelite, appear to be immune from the local race.

Outbreaks and new records.—*F.A.O. Pl. Prot. Bull.*, 1, 8, pp. 121–123, 1953.

Reporting from New Zealand, G. A. H. Helson states that the cold, wet weather with intervening warm periods during the summer of 1952–3 favoured the development of potato blight (*Phytophthora infestans*) [*R.A.M.*, 33, p. 140]. The epidemic appeared first in Auckland in September and October, then in the Wellington area in December and January, and later in South Island, where in mid-March the disease was prevalent and severe. In Canterbury the outbreak was said to be the worst in 20 years. The exceptional weather conditions and the prevalence of

the tomato strain of *P. infestans* [28, p. 37] caused a loss of about 40 per cent. of the tomato crop in Hawkes Bay.

Puccinia antirrhini [C.M.I. map No. 40], not known to be present on antirrhinums in New Zealand, was intercepted in packets of imported flower seeds. *Verticillium dahliae* [*R.A.M.*, 33, p. 140] attacked hops for the first time in New Zealand; the disease is confined to one garden of four acres in Nelson.

New outbreaks of maize rust (*Puccinia polysora*)[C.M.I. map No. 237; *R.A.M.*, 33, p. 226 *et passim*] are listed, including one from Northern Rhodesia.

Pontis Videla (R. E.). **Outbreaks and new records. Venezuela.**—*F.A.O. Pl. Prot. Bull.*, 1, 6, pp. 91–92; 9, p. 140, 1953.

New records for Venezuela [cf. *R.A.M.*, 32, pp. 38, 124, 465] include powdery mildew (*Erysiphe polygoni*) on cowpea, *Ceratostomella* [*Ceratocystis*] *paradoxa* on sugar-cane and maize [C.M.I. map No. 142], *Alternaria cucumerina* on watermelon, neck rot (*Phytophthora parasitica*) of pineapple, and *P. cinnamomi* rootlet rot of avocado [cf. *R.A.M.*, 33, p. 99], the last two being the most serious diseases of the respective hosts in the country.

Xanthomonas phaseoli was not known to be present in Venezuela until 1952, when it was found on beans [*Phaseolus vulgaris*] in Maracay, causing extensive damage during the rainy season. Other new records are of lucerne mildew (*Peronospora trifoliorum*) [cf. 20, p. 292] in Maracay and sugar-cane eyespot (*Helminthosporium sacchari*) [cf. 18, p. 624; 32, p. 339], which caused heavy losses at Guarico.

Muller (A. S.). **Plant disease problems in Central America.**—*F.A.O. Pl. Prot. Bull.*, 1, 9, pp. 136–138, 1953.

The author briefly reviews the chief diseases of crop plants in Central America (between Mexico and Colombia). Three types of bacterial disease are prevalent: tomato and potato wilt (*Pseudomonas solanacearum*) [*R.A.M.*, 30, p. 217], the most important; soft rot of lettuce, carrots, cabbage, [chilli] peppers, and cucurbits due to *Erwinia carotovora* [cf. 17, p. 300]; and cabbage blackleg (*Xanthomonas campestris*) [C.M.I. map No. 136]. Fungi of the genus *Phytophthora* are a serious problem, the most important being *P. infestans* on potatoes [*R.A.M.*, 32, p. 616] and tomatoes. Rusts give concern to wheat growers at the higher altitudes. The commonest, which recurs annually, is leaf rust (*Puccinia rubigo-vera tritici*) [*P. triticina*]. *P. graminis* can be very serious, but it does not appear every year. *P. sorghi* [29, p. 504] is always present on maize, on which *Angiopsora pallescens* [*A. zeae*: loc. cit.] is also prevalent. Sorghum fields have had up to 85 per cent. of the heads destroyed by *Sphacelotheca sorghi* [C.M.I. map No. 220].

One of the most serious diseases locally is sigatoka disease of bananas (*Cercospora musae*) [*Mycosphaerella musicola*: *R.A.M.*, 29, p. 12]. The most dangerous soil-borne disease is Panama disease of bananas (*Fusarium oxysporum* var. *cubense*) [32, p. 634].

Orejuela (C. G.). **Plant pathology in Colombia.**—*F.A.O. Pl. Prot. Bull.*, 1, 7, pp. 97–100, 1953.

Only in recent years has attention been paid in Colombia to wheat diseases, mainly caused by *Puccinia graminis*, *P. rubigo-vera tritici* [*P. triticina*], and *P. glumarum* [*R.A.M.*, 31, p. 371]. A breeding programme to improve wheat varieties is now under way, based on extensive surveys of incidence and severity of rusts in the Sabana of Bogotá. *P. sorghi* produces teleutospores on maize in the cold zones at altitudes of about 2,600 m., but does not develop on the alternate host, *Oxalis*, certain species of which are common weeds locally.

The most important potato disease is blight (*Phytophthora infestans*) [31, p. 254], which appears very frequently in all districts and at all seasons. Colombian

growers take hardly any steps to control diseases, though some potato spraying is carried out, dithane Z-78, having become the most popular fungicide despite its short-term efficacy and high price. Cost is a limiting factor in spraying, profits frequently being so small that no money can be spared for disease control. There are no established spray programmes, and a variety of spraying appliances is used.

The Colombian Plant Protection Service, with a staff of two, is hardly developed and at present functions only in urgent cases.

A list is given of the principal diseases of economic crops. Included are *Cercospora oryzae* [C.M.I. map No. 71] and *Ustilaginoidea virens* [cf. *R.A.M.*, 8, p. 716; 31, p. 83] on rice, *Colletotrichum theobromicola* on cacao [cf. 28, p. 565], *Glomerella gossypii* on cotton [cf. 23, p. 176; 26, p. 219], *Helminthosporium turcicum* [C.M.I. map No. 257], *Diplodia zeae* [cf. *R.A.M.*, 26, p. 130], *Puccinia pallescens* [*Angiopsora zeae*: see preceding abstract], *Physoderma zeae-maydis* [*P. maydis*: cf. 28, p. 284], and *Phyllachora maydis* [cf. 30, p. 194] on maize, *Pseudomonas tabacum* [cf. 32, p. 455], *P. angulata* [cf. 32, p. 456], and *Phytophthora parasitica* var. *nicotianae* [cf. 29, p. 539] on tobacco, *Isariopsis griseola* [cf. 32, p. 616] and *Pseudomonas medicaginis* f.sp. *phaseolicola* [C.M.I. map No. 85] on beans (*Phaseolus vulgaris*), *Streptomyces* [*Actinomyces*] *scabies* on potatoes [cf. *R.A.M.*, 21, pp. 240, 470], *Xanthomonas* [*Pseudomonas*] *solanacearum* [C.M.I. map No. 138] on bananas (*Musa paradisiaca*), and *Fusarium oxysporum* var. *cubense* on bananas [No. 31].

Miller (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 1, 6, pp. 81–82; 7, pp. 104–105; 8, pp. 113–114; 9, pp. 129–131, 1953.

One-year-old nursery stock apple trees growing near Indianapolis, central Indiana, were attacked in 1952 by *Sclerotium rolfsii* [*R.A.M.*, 16, p. 262; cf. 32, p. 681], a fungus rare in Indiana and not previously found in the nursery concerned. Dying trees were first noticed in late July after five weeks' unusually hot weather. Rainfall for the period was largely in heavy flash falls of almost 2 in. each time, totalling 7·61 in. Trees continued to die until late September, about 10 per cent. of the 20,000 trees succumbing. Infections were scattered in the rows. Roots were killed to the soil line, but the stems remained green for some time after the leaves had turned brown. Dead leaves tended to persist after the main root had been girdled. Mycelium and sclerotia were abundant on and near the affected roots. The disease has occasionally affected apple seedlings in Kentucky, Virginia, and Texas.

In the first week of September, 1952, northern leaf blight (*Helminthosporium turcicum*) [31, p. 61; 33, p. 217] killed maize over an area of south-central Wisconsin as well as in the north and extreme north-west and extended westward to the Mississippi; elsewhere in the State the disease was present in almost every maize field, but not to a serious extent. It has never before been so severe or widespread in Wisconsin.

Powdery mildew (*Erysiphe cichoracearum*) on cultivated lettuce [20, p. 556] suddenly reappeared in the Salinas Valley, California, in August 1951, reaching maximum severity and distribution in October and persisting into November. Perithecia were not uncommon on *Lactuca scariola* but the fungus from wild lettuce did not infect cultivated varieties. A field occurrence in 1950, confined to a hybrid between wild and cultivated lettuce growing in an experimental plot, was probably caused by the biological race or races naturally infecting wild lettuce. The circumstances of the 1951 outbreak, however, which chiefly affected the Great Lakes variety, and the reappearance of the disease in October, 1952, when perithecia were abundant on Great Lakes, suggest that one or more races of the fungus pathogenic to cultivated lettuce have arisen in the locality.

In Texas and New Mexico cotton black root rot (*Thielaviopsis basicola*) [33, p.

153] occurs only on light, sandy soil in association with root galls caused by *Meloidogyne* sp. In 1952 wilting was first observed in late June, when the plants were about 75 days old. Collapse was so rapid that the wilted leaves and young 'squares' did not fall off, and many affected plants appeared as if struck by lightning. In the woody tissue of the crowns and roots there was a slight brownish flecking and pale tan discoloration of the cambium, but no appreciable crown swelling or extensive discoloration of the stele until late in the season. Lateral stems usually formed at the cotyledonary node in two or three weeks when plants were attacked early. The disease generally appeared after irrigation, and was especially severe in low places where water stood for long periods. At present, however, it does not appear to constitute a serious threat to the local production of American–Egyptian cotton.

In late November and early December, 1952, lettuce mosaic virus [32, p. 533] was much more prevalent than usual in the Imperial Valley, California, especially in fields planted in late September and October and situated in the centre of the cropping area. The disease was severe also in the Yuma Valley, Arizona, where some fields had almost 100 per cent. infection. The unusual prevalence of the disease in both localities appeared to be correlated with high insect infestation during October and early November, when temperatures were about 10° F. above normal.

In early June, 1952, a survey was made of oat downy mildew (*Sclerospora macrospora*) [21, p. 8; 32, p. 248] in the mid-south of the United States. In Mississippi 85 per cent. of the oat fields examined contained up to 25 per cent. infected plants, while at places in certain fields infection was almost 100 per cent. Losses in yield (estimated at over 200,000 bush.) occurred in 12 counties in the Delta area. The disease was present in three counties in Alabama, where one field had 60 per cent. uniform infection, in eight counties in Arkansas, reaching 7 per cent. in some fields, and in Louisiana, where harvesting was almost over, one field having 15 per cent. infection. The disease also presents a considerable storage problem as harvested grain is accompanied by a large amount of the green tissue of infected plants.

Johnson grass (*Sorghum halepense*) [loc. cit.] in the Mississippi Delta area, attacked during the autumn of 1952 by a species of *Sclerospora* [cf. 33, p. 115], was growing in fields in which oats had been infected by *S. macrospora* in the previous spring.

Parasitologie végétale. [Plant parasitology.]—*Rapp. Cons. Exp. Rech. agron., Algérie, 1952*, pp. 191–227, 1953.

It is stated in this report [cf. *R.A.M.*, 31, p. 228] that in seed treatment trials mercurial salts used at 200 gm. per 100 kg. seed or as a 15-minute steep, methoxyethylmercury chloride in particular, weres uperior to all the other substances tested against barley helminthosporiosis [*Helminthosporium* spp.] and were only very slightly phytotoxic.

In fungicide tests against vine diseases Bordeaux mixture gave the best results against downy mildew (*Plasmopara viticola*) [19, p. 455], followed by S.R.406 [captan], zineb, and nabam. Captan gave the same protection of grapes as Bordeaux. Dusts proved more effective on fruit than on the leaves. Against powdery mildew [*Uncinula necator*: 31, p. 229] at Tipasa and Marzagran wettable sulphur dusts (40 to 45 per cent. active) were on the whole superior to ordinary sublimated sulphur, though at Tipasa they gave insufficient protection to the fruit. Despite three sulphur sprays and two dusts powdery mildew was exceptionally severe in the experimental vineyard in 1952, causing over 80 per cent. yield losses of the normal harvest on *vinifera* and Maxabeo varieties. The grapes and leaves of the following varieties were entirely free from powdery mildew: S[eyne] V[illard] 12,327, 18,315, 18,402, 29,399, 15,062, 12,303, 12,309, 12,364, 12,375, 20,366,

3,056, J.S.26,649, and J.S.16,150; those with resistant foliage and clean fruit were S.V.23,657, 12,347, 23,410, and 5,276; S. 83,65, and 4,643; R. 262; L. 304, 3,774, 2,380, and 2,282; and G.C.2,380 and 261,13.

FRIEDMAN (B. A.). **Serological tests with some phytopathogenic species of Pseudomonas.**—*Phytopathology*, 43, 8, pp. 412–414, 1953.

In view of the morphological and physiological similarity between fluorescent cultures of *Pseudomonas* [see next abstract] isolated from decayed potato tubers, witloof chicory, lettuce, and escarole [endive] at the Division of Handling, Transportation, and Storage of Horticultural Crops, United States Department of Agriculture, New York, 23 named cultures representing 14 *P.* spp. were compared by means of agglutination tests with antisera prepared against *P. syringae*, *P. marginalis* [*R.A.M.*, 31, p. 530], *P. intybi*, and *P. fluorescens*. A culture of *P. lapsa* and two out of three cultures of *P. syringae* appeared to react specifically with *P. syringae* antiserum. Ten cultures obtained from seven species of the genus displayed heterologous cross-reactions denoting the presence of common antigenic substances.

The results secured with *P. syringae* suggest the applicability of serological tests for the identification of isolates of this pathogen. However, the serological heterogeneity evident among the cultures, especially of *P. marginalis* and *P. fluorescens*, limits the present possibilities of serological diagnosis of the species studied.

SHEWAN (J. M.), HODGKISS (W.), & LISTON (J.). **A method for the rapid differentiation of certain non-pathogenic, asporogenous bacilli.**—*Nature, Lond.*, 173, 4396, pp. 208–209, 1 fig., 1954.

Preliminary antibiotic studies conducted at the Torry Research Station, Aberdeen, with the help of Dr. N. Reynolds demonstrated that certain bacterial types could be provisionally classified into two clearly differentiated groups of *Pseudomonas* [see preceding abstract] by this means. Further work led to the development of a method for differentiating Bergey's Pseudomonadaceae, by employing the normal sensitivity test for antibiotics with antibiotic tablets, or a vibriostatic agent in saturated aqueous solution in an assay cup. About 200 strains were tested.

All the pigment-producing pseudomonads studied so far from a variety of sources, though they may have lost the power of pigment production on subsequent subculturing, were insensitive to penicillin (2·5 I.U.), terramycin (10γ), and the vibriostatic compound O/129 (2-4 diamino, 6-7 di-*iso*propyl pteridine). The remaining strains, which grow somewhat slowly and never form pigment under any conditions, were distinguished by their sensitivity to terramycin, though they were insensitive to the other two agents. Any strain sensitive to the vibriostatic agent is classified as a *Vibrio*.

This work was extended to other groups of asporogenous, non-pigmented rods. The Gram-positive Bacteriaceae were sensitive to penicillin and insensitive to streptomycin (80γ), while the reverse was true of the Gram-negative types and the Pseudomonadaceae. The Achromobacteriaceae were sensitive to both agents. All were inhibited by chloramphenicol (100γ).

MANIGAULT (P.). **Étude biochimique et histochimique des tumeurs du crown-gall chez Pelargonium zonale. II.—Phosphatases.** [Biochemical and histochemical study of crown gall tumours on *Pelargonium zonale*. II.—Phosphatases.]—*Ann. Inst. Pasteur*, 85, 5, pp. 602–620, 1 pl., 3 figs., 1953.

The localization of radiophosphorus in the tissues of *Pelargonium zonale* inoculated by various methods with *Agrobacterium* [*Bacterium*] *tumefaciens* [cf. *R.A.M.*, 30, p. 217] at the Institut Pasteur, Paris, was expressed on radiographs by a blackened zone corresponding to phosphatase activity and reaching its maximum intensity at the site of infection.

Ordin (A. P.). Антагонизм почвенных грибов из рода **Penicillium** по отношению к фитопатогенным бактериям. [Antagonism of soil fungi of the genus *Penicillium* in relation to phytopathogenic bacteria.]—Микробиология [*Microbiology, Moscow*], 21, 2, pp. 192–199, 1 pl., 1952.

In experiments at the Moscow Station of the Pan-Soviet Institute of Plant Protection 14 species of *Penicillium* suppressed phytopathogenic bacteria, e.g., *Bacterium carotovorum* [*Erwinia carotovora*], *B.* [*E.*] *aroideae* [strain of *E. carotovora*], and *B. vesicatorium* [*Xanthomonas vesicatoria*], under natural conditions in sterile and non-sterile soil. The largest number of antagonistic strains was isolated from hothouse soil (39·6 per cent.) and the least from virgin soil (7·2 per cent.). *Aspergillus niger* was active also. *P. namylowski* (72 isolates), *P. porraceum* (28), and *P. rubens* (27) composed the major part of the 175 secured. All were equally antagonistic to *E. aroideae* and *E. carotovora*, but only 47·7 per cent. had a suppressing effect on *X. vesicatoria*.

These studies and other features confirm the possibility that *E. aroideae* and *E. carotovora* are closely-related strains of the same species [*R.A.M.*, 33, pp. 74, 217]. Sterile soil inoculated with *E. aroideae* could infect [unspecified] plants in the course of 120 days, whereas when the antagonist was introduced at the same time the soil had lost is infective property by the 30th day. When *E. aroideae* is introduced into non-sterile soil alone it dies off on the 30th day and when together with the antagonist on the 10th day.

It is concluded that the presence of antagonistic *P.* spp., comprising a considerable percentage of soil microflora, is partly responsible for the death of phytopathogenic bacteria in the soil.

Slykhuis (J. T.). **Virus diseases of cereal crops in South Dakota.**—*Tech. Bull. S. Dak. agric. Exp. Sta.* 11, 28 pp., 11 figs., 1 graph, 2 maps, 1952.

An account is given of a survey, started in 1949, of the virus diseases of cereal crops in South Dakota. Wheat streak mosaic [*R.A.M.*, 32, pp. 122, 552, 674], though severe only in areas where winter wheat is grown, caused losses in both spring and winter wheat in 22 counties during three years. Oats, barley, Falconer maize, and nine annual grass weeds frequently occurring in South Dakota grain fields were all susceptible.

Wheat striate mosaic virus, causing fine, parallel, chlorotic streaks and dashes on the leaves, followed by general chlorosis, necrosis in some varieties, stunting, and sometimes death, is reminiscent of Russian wheat mosaic virus [19, p. 268] and was seen in seven counties. It overwinters in winter wheat, is not transmitted by manual methods, but is spread naturally by a common leafhopper, *Endria inimica*, in early June and throughout the summer. Early winter wheat plantings become infected during late August and early September.

Traces of barley false stripe [32, p. 674] have been observed throughout the State. In inoculation experiments wheat, rye, millet (particularly the *Setaria* type), and three varieties of maize became systemically infected. Nine annual grass weeds were also susceptible.

Agropyron streak mosaic virus was found in 1950; it caused a mild green to yellow streak mosaic pattern on the leaves of *A. repens*. It was transmitted by rubbing to wheat, the symptoms resembling those of wheat streak mosaic virus [33, p. 22 and next abstract], though milder, to rye, and several *A.* spp.; *A. elongatum* was severely stunted.

Gold (A. H.), Houston (B. R.), & Oswald (J. W.). **Electron microscopy of elongated particles associated with Wheat streak mosaic.**—*Phytopathology*, 43, 8, pp. 458–459, 1 fig., 1 graph, 1953.

Flexuous, elongated particles, 15mμ in diameter and with a most frequent

length about 670mμ, were observed in Sonora wheat plants inoculated with the California isolate (abs. in *Phytopathology*, 42, p. 12, 1952) of wheat streak mosaic virus [see preceding abstract] and did not occur in healthy ones. In old infections the concentration was about 5×10^{11} particles per gm. fresh weight of leaves. Attempts to separate the particles from other tissue components have so far been unsuccessful, but only the fractions containing them were infective.

Lučić (Slobodanka). Сузбијање рђе хемиским средствима. [Controlling rust with chemical compounds.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 12, pp. 43–48, 2 pl., 1952. [English summary.]

In laboratory and field trials for the control of brown rust [*Puccinia triticina*: cf. *R.A.M.*, 32, p. 243] on wheat at the Institute for Plant Protection, Beograd, 1 per cent. sulfinette [31, p. 355], 0·1 per cent. colloidal sulphur, and 0·15 per cent. duphar [31, p. 334 and below, p. 292] were most effective when applied three times (before earing, after flowering, and before wax ripeness) under normal weather conditions, or more often in bad weather, the infection percentages being 0, 15, and 10, respectively, as against 100 for the untreated. No uredospore germination occurred after treatment with sulfinette and none were found on the leaves after treatment. A very small percentage of uredospores germinated after treatment with the other two chemicals and only about 10 to 15 per cent. were found on the leaves. Bordeaux mixture (0·5, 1, and 2 per cent.) allowed 40 per cent. infection at all three concentrations [cf. below, p. 288].

Leukel (R. W.). **Cooperative tests of seed-treatment chemicals on spring Wheat and Oats in 1953.**—*Plant Dis. Reptr*, 37, 12, pp. 587–594, 1953. [Multilithed.]

Co-operative field tests were carried out in 1953 at nine stations in the United States to compare the value of several newer cereal seed treatments with that of standard ones [cf. *R.A.M.*, 32, p. 549]. None of the treatments used, except helixin B (liquid, 2·5 oz. per bush.) [33, p. 225], significantly reduced the emergence of Red Bobs wheat in steamed soil in the greenhouse at Beltsville, Maryland. In soil inoculated with *Fusarium culmorum*, *F. graminearum* [*Gibberella zeae*], *F. moniliforme* [*G. fujikuroi*], and *Helminthosporium sativum* emergence was increased by 4 to 11 per cent. by 15 of the treatments; subsequent seedling blight was reduced by agrox dust and slurry (0·5 oz.), ceresan M dust (0·5), panogen liquid (0·75), and setrete liquid (0·5) to between 1·4 and 5·9 per cent. compared with 58·8 and 59·8 per cent. for the untreated. Bunt (*Tilletia caries*) [loc. cit. and next abstract] on artificially inoculated seed was completely controlled at five stations by helixin B, MEMA liquid (0·5), panogen, setrete, fermuline liquid (8 per cent. phenyl mercury salicylate plus 10 per cent. iron octoate; 0·75), agrox slurry, mergamma slurry (2), and mycon slurry (7·7 per cent. methyl arsenic sulphide; 1·5) and was reduced to less than 0·1 per cent. by ceresan M dust and slurry (0·5) and vancide 51 liquid (4) as against 0·8 to 84·7 per cent. for the untreated.

In trials at eight stations for the control of smuts (*Ustilago avenae* and *U. kolleri*) [32, p. 549] in naturally infected Canadian oats, panogen and ceresan M slurry eliminated the disease and ceresan M dust, helixin B [33, p. 226], and mycon slurry reduced infection to 0·1 per cent. or less. The low disease incidence (average 8·6 per cent.) on oats grown from untreated seed was probably due to environmental conditions unfavourable to infection. In greenhouse trials 36 per cent. of the plants became infected.

A list is given of a number of seed-treatment fungicides, their composition, the concerns producing or marketing them, and the uses for which the manufacturers recommend them. The potential market for such materials in the United States is discussed.

Holton (C. S.) & Woo (J. Y.). **Seed-treatment test for bunt (Tilletia caries) control in winter and spring Wheat at Pullman, Washington in 1952–53.**—*Plant Dis. Reptr*, 37, 12, pp. 583–584, 1953. [Multilithed.]

Most of the seed treatments tested for the control of wheat bunt (*Tilletia caries*) [*R.A.M.*, 32, p. 308 and preceding abstract] at Pullman, Washington, in 1952–3 proved effective, mycon, anticarie (both at ½ oz. per bush.), puratized C13–1212 and C4–10 (complex phenyl mercury compounds from Gallowhur Chemical Corporation, 1 oz.), 75 per cent. PCNB (pentachloronitrobenzene, 1 and 2 oz.), and N.P.1083–D (a dinitrofluorobenzene, Penn Salt Company, 2 oz.), all slurries, eliminating infection from both Orin winter and Red Bobs spring wheats, compared with 13 to 32 and 38 to 50 per cent. bunt, respectively, on the untreated. Complete control on winter wheat was obtained with mergamma slurry (2½) and on spring wheat with ceresan M (½), agrox (½), brassicol (2), 20 per cent. PCNB (2), and velsicol (an organic mercury compound, Velsicol Corporation, Chicago, Illinois, 1 oz.), all slurries, and panogen (½ and ¾), setrete (½ and ¾), MEMA (½), 71PMU (¾), vancide 51 (2), and merculine (½), all liquids.

Hess (H.). **Ein Beitrag zum Problem der induzierten Abwehrreaktionen im Pflanzreich.** [A contribution to the problem of induced defence reactions in the plant kingdom.]—*Phytopath. Z.*, 16, 1, pp. 41–70, 2 graphs, 1949.

Following a comprehensive survey of the literature (63 titles), from which the author tabulates (with an indication of method and results) examples of local and humoral (whole plant) pre-immunity [*R.A.M.*, 32, p. 269] and of the sensitization of host plants with killed cultures of parasites, culture filtrates, and extracts, statistically analysed results are given of detailed studies on the infection of wheat and barley by *Helminthosporium sativum*. These involved experiments on the lines followed by Zoja [5, p. 246] and Leeman [11, p. 529]. The findings of the former could not be substantiated though they were not refuted by the present work. The metabolic products of the fungus in different types of nutrient solution (Richards, Czapek, and Hayduk) had a harmful effect on the development of barley, but they were ephemeral, being found only in relatively young cultures (three weeks old). They appear to become inactivated, partly by the change in pH, and are also sensitive to heat. An antibiotic substance active against *Bacillus mesentericus* was present in the culture filtrate and plant injury is attributed primarily to this substance. No antibodies could be detected either in the host or diffusing into the agar in which it was growing, though there was some evidence of their local production. Barley proved an unsuitable host in these tests because its susceptibility was altered by even slight changes in the nutrient solution and by hindered development.

Hashioka (Y.) & Morihashi (T.). **Application of dithane Z-78 to the rusts and powdery mildew of cereals.**—*Contr. Hokuriku agric. Exp. Sta.*, 7 pp., 15 graphs, 1952. [Japanese summary. Mimeographed.]

In studies at Hokuriku Agricultural Experiment Station, Takada, Japan, potted wheat plants at the two- to three-tiller stage were sprayed with various fungicides and later inoculated with leaf rust (*Puccinia triticina* race 5) [cf. *R.A.M.*, 30, p. 620] and powdery mildew (*Erysiphe graminis* f.sp. *tritici*) [cf. 16, p. 633]. Rust development was prevented by dithane Z-78, especially when used at a concentration of 1 in 500, and by lime-sulphur (0·5° Baumé solution). Mildew was clearly repressed only by lime-sulphur. In slide tests at 24° C. with uredospores of *P. triticina* and barley leaf rust (*P. hordei*) [30, p. 620] germination was appreciably reduced in dithane Z-78 solutions even at a dilution of 1 in 100,000, though this concentration had little effect on the conidia of *E. graminis*, and some germination occurred even

in a 1 in 16,000 solution. The minimum concentration of lime-sulphur suppressing germination of *E. graminis* and *P. triticina* was 1 in 1,000 and of *P. hordei* 1 in 500. Uredospore germination of both rusts was completely inhibited by dry spray residues of dithane Z-78 at all concentrations tested, whereas the inhibiting effect of the lime-sulphur was lost within 20 days. *E. graminis* spores germinated profusely within nine days in any of the fungicide residues. Used as a dust, dithane Z-78 was almost completely inhibitory and was much more effective than lime-sulphur in suppressing germination of all three fungi [cf. above, p. 286].

Spraying potted Norin No. 24 wheat seedlings and Aizu No. 5 barley at the tillering stage with dithane Z–78 (1 in 750 and 1 in 1,000) or dusting with 6 per cent. dust was distinctly effective in reducing subsequent infection by the two rusts, though infection increased in proportion to the period that elapsed between treatment and inoculation. Fungicidal applications after inoculation but before the appearance of sori, and after infection was apparent did not prevent rust development.

It appears that dithane Z-78 may be useful against cereal rusts for the northern districts of Japan.

Laude (H. H.), Painter (R. H.), Johnston (C. O.), Schlehuber (A. M.), & Johnston (T. H.). **Ponca winter Wheat.**—*Bull. Kans. agric. Exp. Sta.* 354 (*Bull. Okla. agric. Exp. Sta.* B–380), 14 pp., 2 figs., 1 diag., 1 map, 1952.

A new winter wheat variety, Ponca, highly resistant to 9 of 12 important races of leaf rust [*Puccinia triticina*: *R.A.M.*, 33, p. 77], was released by Kansas and Oklahoma Agricultural Experiment Stations in 1951. It is almost as resistant to loose smut [*Ustilago tritici*] as Pawnee [28, p. 116], but is susceptible to bunt [*Tilletia caries*: 33, p. 146], *Septoria* leaf blotch [*S. tritici*: 33, p. 220], race 15B of stem rust [*P. graminis*: loc. cit.; 31, p. 482], and bacterial head blight [unspecified]. Ponca is less winter hardy than Pawnee and is, therefore, recommended as being best adapted to eastern Oklahoma and eastern Kansas. [This information also appears in *Seed World*, 71, 4, p. 37, 1952.]

Henry (A. W.), Peterson (E. A.), & Millar (R. L.). **Compatibility of acti-dione and orthocide in the treatment of seed.**—*Phytopathology*, 43, 8, p. 461, 1953.

In preliminary greenhouse and field trials at the University of Alberta, Canada, orthocide 406 [captan] was the most promising of the fungicides applied in combination with actidione for the control of covered smut [bunt] of wheat [*Tilletia caries* and *T. foetida*: *R.A.M.*, 31, p. 428 and above, p. 287]. Neither material alone improved emergence, but a combination of both at dosages as low as ½ oz. per bush. did so.

Warmbrunn (K.). **Neue Wege zur Zwergsteinbrandbekämpfung.** [New ways of dwarf bunt control.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 5, 10, pp. 154–157, 1953.

The practicability of combating wheat dwarf bunt [*Tilletia brevifaciens*] by soil disinfection with brassicol [*R.A.M.*, 33, p. 223] was demonstrated by large-scale experiments at the Hohenheim Plant Protection Institute, Württemberg, Germany, in the autumn of 1952. The fungicide, alone or mixed with a commercial fertilizer, may be applied to the soil by hand or machine. Knapsack dusters proved much easier to manipulate than motorized equipment, but the objection to either of these methods is their extreme dependence on wind. For the elimination of up to 1 per cent. infection 25 kg. per ha. suffices; 50 kg. should be generally adequate, though for an incidence exceeding 10 per cent. 75 kg. should be used.

Further experiments are necessary to decide whether the treatment should be given before or after sowing.

Ponchet (J.), Guntz (M.), & Charmet (F.). **Essais de traitement de la carie du Blé, Tilletia tritici (Bjerk). Wint., en sol infesté.** [Trials on the treatment of Wheat bunt, *Tilletia tritici* (Bjerk.) Wint., in infested soil.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 3, 4, pp. 415–421, 1952.

In tests at Sivry-Courtry (Seine-et-Marne), France, for the control of bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, 31, p. 484] Bon Fermier wheat was sown in November, 1950, in a field naturally infected the year before, the soil being further contaminated by a mixture of bunt spores and talc. Hexachlorobenzene [33, p. 222] was used as a seed disinfectant at 44 per cent. and also applied to the rows at sowing time. At Versailles the whole surface of a field was treated with the same product mixed with the soil to a depth of 5 cm. The results demonstrated that soil treatment (10 kg. dust per ha.) gave satisfactory control, provided the whole field was covered, treatment of the rows only being inadequate and giving irregular results. Seed treatment also gave satisfactory control, and should be adequate unless the soil is very heavily contaminated, the upper safe limit being 200 gm. of 44 per cent. hexachlorobenzene per ql. of seed. A number of other seed disinfectants tested were inefficient.

Mamontova (Mme A. N.). Получение высокоактивных антигрибных сывороток. [Obtaining highly active antifungal sera.]—Микробиология [*Microbiology, Moscow*], 21, 2, pp. 200–204, 1952.

The results of experiments at the Pan-Soviet Scientific Research Institute for Plant Protection, Leningrad, indicated that in attempting to obtain highly active antifungal sera [cf. *R.A.M.*, 18, p. 162] with one and the same method of immunization of [unspecified] animals, i.e., by introducing internally a spore suspension of wheat loose smut (*Ustilago tritici*) [31, p. 11; 33, p. 20], the spores having previously germinated, the amount of globulin introduced into the animal plays a fundamental part. When the number of *U. tritici* spores introduced is increased the strength of the sera obtained is also increased. A long interval between the two series of injections, however, reduces the strength. The low activity of antifungal sera is explained by the insignificant content of easily soluble globulins in fungi. Activity is increased when animals are immunized with globulin obtained from the fungus spores. The highly active sera give a positive reaction with the antigen of a susceptible wheat variety within 1 to 15 minutes and in the course of an hour it reaches its maximum intensity.

Pugsley (A. T.) & Carter (M. V.). **The resistance of twelve varieties of Triticum vulgare to Erysiphe graminis tritici.**—*Aust. J. biol. Sci.*, 6, 3, pp. 335–346, 1953.

A genetic study was made at the Waite Agricultural Research Institute, University of Adelaide, of the resistance of 12 wheat varieties to a South Australian isolate of *Erysiphe graminis tritici* [cf. *R.A.M.*, 33, p. 76]. This isolate, maintained since 1940 on a single variety, was resolved into two physiologic races, P and P–1, differentiated by their reactions on the variety Chul, which is susceptible to the former and resistant to the latter. Three distinct genes for mildew resistance, designated tentatively as Ml_t, Ml_u, and Ml_s, were identified, with a possible fourth in Normandie. The 12 varieties fall naturally into three groups. Axminster, Birdproof, Converse, Huron, Kenya C. 6041, Thew, Norka, and Normandie, comprising group A, possess a common gene Ml_t which confers resistance to mildew at all stages of growth. It is completely linked with a gene conferring resistance to race 135AB of *Puccinia triticina* [cf. 33, p. 221]. Normandie may possess, in addition, Ml_u. The variety Ulka, representing group B, also derives its mildew resistance from Ml_u. The three varieties of group C, Indian, Sonora, and Sturgeon, are resistant to mildew from the three-leaf stage onwards, apparently owing their

resistance to Ml_8. Groups B and C are both susceptible to *P. triticina* 135AB. Norka possesses a second, independent gene for leaf rust resistance, conferring freedom from race 138BB.

Sallans (B. J.) & Simmonds (P. M.). **Piebald or yellowberry in hard spring Wheat.** —Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 22, 1953.

During work on root diseases of cereals carried out at the Laboratory of Plant Pathology, Saskatoon, Saskatchewan, observations were made on factors influencing the development of piebald kernels or yellowberry [cf. *R.A.M.*, 25, p. 550] (starchiness) in wheat. Infection with *Pythium arrhenomanes* and the addition of potassium nitrate almost completely suppressed the development of starchiness. Soil applications of potassium nitrate reduced the percentage of piebald kernels considerably. Leaching the soil at the pre-flowering stage, maintaining high soil moisture, and the addition of potassium dihydrogen phosphate all favoured the development of the disorder and were used to induce it in varietal trials. It was found difficult to induce piebald in Garnet and Regent and less so in Thatcher. On the other hand, Mindum, Red Bobs, and Marquis readily yielded piebald kernels under these conditions.

It is thought that environmental factors inducing the disorder reduce the quantity of protein relative to the amount of carbohydrate in the grain.

Cherewick (W. J.). **Association of ergot with loose smut of Wheat and of Barley.**— *Phytopathology*, 43, 8, pp. 461–463, 1 fig., 1953.

At the Laboratory of Plant Pathology, Winnipeg, Canada, in 1950 and 1951 infections of ergot (*Claviceps purpurea*) were frequently observed to follow the inoculation of wheat and barley with loose smuts (*Ustilago tritici* and *U. nuda*, respectively). Loose smut collections were found to contain an abundance of ergot conidia. One such collection, held for 18 months at room temperature, contained viable conidia which caused infection in floral inoculation experiments, whereas those in desiccated honeydew, stored under comparable conditions, did not. The inoculation of wheat and barley florets with ergot conidia after removal of the ovaries and stamens before anthesis usually resulted in the development of the sphacelial stage, especially in a humid atmosphere. Sometimes irregular sclerotia developed in the empty glumes. Injections of a conidial suspension into the sheaths, before the emergence of heads, was followed by the transformation of the entire head into an ergot sclerotium, while sclerotial masses were often produced in the stems between the upper node and the head. When the plants were decapitated before inoculation, sclerotia were formed in the stem. The inoculation of smutted heads just before emergence caused the development of the sphacelial stage of *C. purpurea* on the surviving portions of the glumes.

From these observations it appears that ergot may infect not only the young ovaries but any physiologically young tissue of wheat and barley plants. The association of ergot conidia with loose smut spores,which are naturally disseminated by air currents, not only provides one method for the spread of *C. purpurea* but may be related to its prevalence on varieties susceptible to loose smut, such as Montcalm wheat and Lee barley.

Russell (R. C.). **The 'drowning treatment' for loose smut of Barley.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 21, 1953.

In work at the Laboratory of Plant Pathology, University of Saskatchewan, Saskatoon, control of loose smut of barley [*Ustilago nuda*: *R.A.M.*, 33, p. 78] was secured by soaking infected seed in pure water in corked flasks filled and kept at 70° F. for up to 4 days. It is suggested that anaerobic respiration carried on by

the seed may have resulted in the formation of by-products lethal to the smut, or that an antibiotic influence may have been exerted by bacterial growth.

Mehta (P. R.), Singh (B.), Mathur (S. C.), & Singh (S. B.). **Varietal reaction to covered smut of Barley.**—*Sci. & Cult.*, 19, 5, pp. 262–263, 1953.

Losses estimated at 2,500 tons (based on 2 per cent. infection) of barley, an important crop covering some 4,000,000 acres in Uttar Pradesh, India, are reported to be due to infection with covered smut (*Ustilago hordei*) [*R.A.M.*, 33, p. 22]. The results of varietal resistance trials carried out in the Province from 1949 to 1953 are summarized here. The standard method of inoculation, in which seeds were soaked in water containing 2 gm. smut spores per 100 ml., the mixture then being exposed to vacuum, gave consistent and high percentages of infection. Of the 20 varieties and strains of barley tested, K12, C84, and CN294 were resistant (under 2 per cent. infection); NP13, C44, CN292, 40/24, 42/69, and 42/72 were intermediate (below 10 per cent.), while NP21 and C251, the most widely grown barley varieties in Uttar Pradesh, were susceptible. K12 was also resistant to stripe (*Helminthosporium gramineum*) [loc. cit.] and compared favourably with NP21 and C251 in yield.

Andrén (F.). **Orienterade betningsförsök mot penselmögel på utsäde.** [Preliminary disinfection experiment against the brush mould on seed.]—*Växtskyddsnotiser, Stockh., 1953*, 3, pp. 38–39, 1953.

In a small-scale experiment at the Swedish Plant Protection Institute, Stockholm, adequate control of the increasingly troublesome *Penicillium* infection of threshed barley seed was obtained by treatment with a combination of a thiram-containing preparation, e.g., arasan or aatiram, at 25 or 50 per cent. and a mercurial at 1 per cent., the latter introduced for the simultaneous elimination of *Fusarium* and smuts [*Ustilago* spp.]. Arasan alone was also effective against the mould.

Earhart (R. W.) & Moseman (J. G.). **Possible desirable germplasm in new Oat introductions grown in Florida and North Carolina in 1952–53.**—*Plant Dis. Reptr*, 37, 12, pp. 597–598, 1953. [Multilithed.]

During the 1952–3 season 86 newly introduced varieties and selections of oats were tested for reaction to crown rust (*Puccinia coronata avenae*) [*R.A.M.*, 32, p. 310; 33, p. 149] and stem rust (*P. graminis avenae*) [32, p. 675; 33, p. 148] under epiphytotic conditions at Gainesville, Florida. DLM3, La Estanzuela Fa au 12, and La Prevision, all from Argentina, and Bage 1419/36 50–2626 and Urugland 50–2779 from Sweden were highly resistant to *P. coronata*, while Rothenburger (Scotland) and 2296 (Australia) were resistant to *P. graminis*. Bulk Selection 212 (Argentina), 320 (Morocco), La Prevision, and 2296 proved highly resistant to soil-borne [apical and eyespot] mosaic viruses [32, p. 618] at Statesville, North Carolina.

Kišpatić (J.) & Lušin (V[era]). **Prašna snijet Kukuruza.** [Head smut of Maize.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 12, pp. 18–29, 1952. [English summary.]

In studies at the Institute for Plant Protection, Zagreb, on the biology and control of maize head smut (*Sorosporium reilianum*) [*Sphacelotheca reiliana*: see above, p. 280 and *R.A.M.*, 28, p. 120] the chlamydospores of the fungus were found to be ripe after a resting period of three to four months and 5 to 20 per cent. began to germinate in February and March, but the majority started in April when temperatures were higher. With the aid of the Reed, Swabey, and Kolk infection method [6, p. 548], the optimum temperature for infection of maize seedlings was

determined to be near 24° C. At 11° and 15° all the plants remained healthy, thus indicating the importance of early sowing.

A 30-minute immersion of the chlamydospores in various concentrations of ceretan [ceresan] and copper sulphate showed that the *doses curativae* were 0·0125 to 0·025 and 0·025 to 0·05 per cent., respectively. Field control was secured by dusting maize grain, artificially infested with 5 gm. chlamydospores per kg. seed, with a mercury dust such as ceresan or duphar (150 gm. per 100 kg. seed) [see above, p. 286] or with copper carbonate (250 gm.). In varietal inoculation trials the Osmak strains and varieties (a Croatian type with a shorter 'vegetation') appeared more resistant than Zuban and Hrvatica, but a better method of artificial infection is needed.

Chlamydospores in the soil are believed to be more important for the natural infection of maize than seed-borne spores.

Leukel (R. W.) & Webster (O. J.). **Sorghum seed-treatment tests in 1953.**—*Plant Dis. Reptr*, 37, 12, pp. 585–586, 1953. [Multilithed.]

Most of the 17 fungicides tested for the control of covered kernel smut (*Sphacelotheca sorghi*) on infested seed of Sharon Kafir and Leoti sorgo sorghum at Beltsville, Maryland, and Lincoln, Nebraska, in 1953 [cf. *R.A.M.*, 32, p. 310] increased the percentage emergence in [smut] infested soil by amounts ranging from 9 to 19. Mycon (slurry, 1 oz. per bush.), though giving inadequate protection [against soil organisms], was perfect as a seed disinfectant, while the usually good protectants orthocide, vancide, agrox, mercusol, and secrete failed to eliminate smut in Leoti sorgo. Complete control of smut at both locations in Leoti and at Beltsville in Kafir (which failed to head at Lincoln) was also given by arasan S.F.X. (1·5), phygon (1), ceresan M (0·5), and ceresan M2X (0·25), all slurries, liquid panogen (0·75), and the dusts, puratized C–4–10 (1) and puratized C–13–1212 (0·5) [cf. above, p. 287]. The percentages of smutted heads from untreated seed ranged from 4 to 75·6 per cent.

Stepanov (K. M.) & Shaluishkina (Mme V. I.). Плоды и семена Лимона — источники заразного начала инфекционного усыхания («Мальсекко»). [Lemon fruit and seeds—sources of initial infectious desiccation ('mal secco').]—Микробиология [*Microbiology, Moscow*], 21, 1, pp. 48–51, 1 pl., 1952.

Studies at the Pan-Soviet Scientific Research Institute of Plant Protection, Leningrad, in 1949, showed that all parts of the fruits and seeds of lemons fallen from trees affected with *Deuterophoma tracheiphila* [*R.A.M.*, 33, p. 150] are infested by the fungus. The mycelium was resistant to prolonged low temperature (−25° C.). Transport of lemon fruit and seeds from farms with diseased trees to new farms or areas should be prohibited and seeds tested before use.

Jenkins (Anna E.), Knorr (L. C.), & Bitancourt (A. A.). **Notes on spot anthracnoses and related subjects. V. Discovery of Tryon's Citrus scab in Argentina.**—*Rev. argent. Agron.*, 20, 4, pp. 230–232, 1 fig., 1953. [Spanish summary.]

In July, 1952, leaves of rough lemon seedlings in a nursery at Ajni, Entre Rios, Argentina, bore scab lesions which, when compared with Australian material, proved to be identical with those caused by *Sphaceloma fawcettii* var. *scabiosa* [*R.A.M.*, 23, p. 251], probably introduced on nursery stock imported from Australia about thirty years ago [cf. 29, p. 603]. A recent survey of scab pathogens occurring in Argentina (*Rev. sudamer. Bot.*, 8, pp. 29–44, 1949) gave no evidence of its presence.

McClean (A. P. D.). **Citrus vein-enation virus.**—*S. Afr. J. Sci.*, 50, 6, pp. 147–151, 2 figs., 1954.

Citrus vein enation virus, recently reported from California [*R.A.M.*, 32, p. 622], was first observed in South Africa in 1951 in an experimental Seville orange seedling inoculated by a bud graft from an orchard Ponderosa lemon tree. Sub-inoculations to healthy West Indian lime seedlings produced this virus only and not the stem-pitting and tristeza complex also affecting the lemon. So far it appears to be of minor importance. Seedlings of West Indian lime, Seville orange, and rough lemon show well-defined symptoms which have persisted on new growth after two years.

The virus was transmitted successfully to 30 out of 32 seedlings of different species (wedge-grafted laterally in the stems or as top grafts in the stumps of decapitated seedlings), namely West Indian lime, Lisbon lemon, rough lemon, Palestine sweet lime, Seville and sweet orange, and sweet orange on Seville rootstock. Symptoms also developed after grafting into four West Indian lime seedlings already infected with a mild strain of stem pitting [33, p. 80] and into two budlings of sweet orange on Seville stock also infected with a form of stem pitting of which the composite trees were tolerant. There was further evidence that the vein enation virus does not add to the severity of the disease caused by the mild, comparatively severe, or severe strains of the stem pitting virus.

The detection of vein enation virus in orchard trees by graft inoculations to indicator plants is complicated when the trees also contain a form of the stem pitting-tristeza complex, as most of the South African (standard colonial) trees do. When both virus types are transmitted together the development of vein swellings depends largely on the tolerance of the indicator species. If the indicator is sensitive to stem pitting this may inhibit the development of vein swellings and for this reason West Indian lime is unsuitable as an indicator. Rough lemon, being tolerant, may prove more useful.

Two attempts were made to transmit the virus by *Aphis citricidus*. In the first, from a pure source, one seedling (a grapefruit) out of 33 of various types developed vein swellings, whereas in the second, from a mixed source containing the stem pitting complex, the number was 24 out of 38. Vein-swelling symptoms from 11 of the latter were secured on sub-inoculation to West Indian lime. There is also evidence that it is sometimes possible to separate some components of virus complexes or mixtures in citrus trees by means of *A. citricidus*.

Menon (K. P. V.) & Nair (U. K.). **Scheme for the investigation of the root and leaf diseases of the Coconut Palm in south India. Consolidated final report of work done from 8th March 1937 to 31st March 1948.**—*Indian Coconut J.*, 5, 1, pp. 5–19; 2, pp. 81–100, 113, 3 pl., 1 map, 1 graph, 1952. [Received 1953.]

During the period under report, extensive disease surveys were carried out in the coco-nut-growing areas of Travancore and Cochin, India. On palms attacked by root disease or wilt [*R.A.M.*, 15, p. 15] the leaves in the outer whorl turn yellow and droop, later becoming brown, drying, and dropping off. Leaves produced after infection are dwarfed and shed quickly. An early symptom is the shedding of immature nuts; this ceases after a few months but the quality of those formed later is affected and eventually the tree is attacked by bud-rot [? *Phytophthora palmivora*: 27, p. 159; 33, p. 152], the crown is blown off by the wind, and the tree dies. Isolates obtained from roots of severely diseased palms, which were in an advanced state of deterioration, included *Botryodiplodia theobromae* [cf. 19, p. 531], *Rhizoctonia bataticola* [*Macrophomina phaseoli*: cf. 7, p. 718], and *R.* [*Corticium*] *solani*, all of which attacked and killed seedlings in inoculation experiments.

The first symptom of the leaf rot disease is a blackening and shrivelling of the distal ends of leaflets in the inner whorls of leaves. These are broken off by the

wind; reddish brown spots appear on the young leaves, and a soft rot develops in the central shoot and in each one replacing it, the tree finally dying. The disease affects trees less than 25 years old but not nursery seedlings. *Helminthosporium halodes* (not previously recorded on coco-nut), *Gliocladium roseum*, *Gloeosporium* sp. (*?Colletotrichum paucisetum*), and *Pestalotia palmarum* [cf. 29, p. 89] were isolated from diseased leaves. Spores of these fungi were present in large numbers in the atmosphere in infected areas during periods of high humidity.

At the Central Coconut Research Station, Kayangulam, comparative chemical analyses of soil samples, leaves, and oil from infected and healthy areas showed that trees in impoverished soils were the first to be affected by the root disease. Applications of 5,000 lb. green manure plus 7 lb. groundnut cake and 25 lb. wood ash per acre gave the greatest improvement. Spraying with half strength Bordeaux mixture helped to lessen the incidence of the leaf disease.

Menon (K. P. V.), Nair (U. K.), & Pandalai (K. M.). **Influence of waterlogged soil conditions on some fungi parasitic on the roots of the Coconut Palm.**—*Indian Coconut J.*, 5, 2, pp. 71–79, 3 pl., 1952. [Received 1953.]

Investigation of the high incidence of root diseases in coco-nut palms [see preceding and next abstracts] on river banks and other land liable to flooding in India led to the idea that waterlogged soil conditions might affect the parasitic activity of the fungi concerned. Soil inoculations of seedling palms in tubs with pure cultures of fungi from infected roots demonstrated that *Rhizoctonia* [*Corticium*] *solani*, *R. bataticola* [*Macrophomina phaseoli*], and *Botryodiplodia theobromae* [loc. cit.], in that order of infectivity, were among the parasites attacking the roots and that waterlogging acted as a predisposing factor.

Lily (V. G.), Nair (U. K.), Pandalai (K. M.), & Menon (K. P. V.). **Observations on the inhibitory activity of a species of bacterium on some fungi parasitic on the Coconut Palm.**—*Indian Coconut J.*, 5, 4, pp. 162–170, 1 pl., 1952. [Received 1953.]

At the Central Coconut Research Station, Kayangulam, a bacterium probably belonging to the *Bacillus subtilis* group [*R.A.M.*, 33, p. 105] was found to be antagonistic in culture to *Helminthosporium halodes*, *Botryodiplodia theobromae*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], *R.* [*Corticium*] *solani*, *Gliocladium roseum*, and a *Fusarium* sp., the causal fungi of the root and leaf diseases of the coco-nut palm in India [see preceding abstracts]. In mixed inoculation experiments the presence of the bacterium prevented leaves from becoming infected by *H. halodes*. The bacterium lyses the fungal mycelium and probably produces an active fungicide.

Sankarasubramony (H.), Pandalai (K. M.), & Menon (K. P. V.). **The manganese content of soil and plant tissue in relation to the root and leaf diseases of the Coconut Palm.**—*Indian Coconut J.*, 4, 3, pp. 165–170, 1951. [Received 1953.]

As a result of recent findings concerning the 'unknown disease' of the coco-nut palm in Jamaica [*R.A.M.*, 29, p. 24] an investigation was made of the relation of manganese to a similar disease in India [cf. preceding abstracts]. The amount of manganese detected ranged from a trace to 435 p.p.m. in soils and 176·5 in tissue samples from various areas. There appeared to be no correlation between disease incidence and manganese status.

Childs (J. F. L.) & West (E.). **Butt rot of Queen Palms in Florida associated with Ganoderma sulcatum.**—*Plant Dis. Reptr*, 37, 12, pp. 632–633, 1 fig., 1953. [Multilithed.]

Ganoderma sulcatum [cf. *R.A.M.*, 24, p. 435] was observed on two 17-year-old

queen palms (*Arecastrum romanzoffianum*) (*Plant Dis. Reptr, Suppl.* 148, p. 270, 1944) affected by butt rot and defoliation at Orlando, Florida. Inside the trunk decay extended upwards for some 24 in. Newly infected tissue was hard and beef-red in colour with a dark brown outer border. Tissues near the base of the trunk were straw-yellow and progressively softer. *G. sulcatum* also occurred on dying queen palms in Inverness, Sarasota, and Mountain Lake, always in situations where the trunks were densely shaded.

Arndt (C. H.). **Tight-lock of Cotton, associated fungi and pH values in South Carolina in 1952.**—*Text. Res. J.*, 23, 8, pp. 533–535, 1953.

The principal fungi associated with tight lock of seed cotton in South Carolina in 1952, in order of decreasing prevalence, were *Fusarium* spp., *Alternaria* spp., *Diplodia gossypina* [*R.A.M.*, 31, p. 326], and *Colletotrichum* [*Glomerella*] *gossypii* [33, p. 82]. *D. gossypina* was relatively more abundant on small, dense, black locks than on the larger tight locks. The pH of the locks varied with the fungi involved, the mean value of those infected by *D. gossypina* being 7·9 or lower compared with 8 to 8·9 for *A.* and *F.* spp., while the corresponding level for normally fluffed seed cotton was generally below 8. Other organisms collected on the locks included species of *Rhizoctonia*, *Macrophomina*, and *Cladosporium*.

Allen (R. M.). **Verticillium wilt of Cotton: studies of possible seed transmission.**—*Diss. Abstr.*, 13, 4, p. 463, 1953. [Mimeoprinted.]

Studies at the University of Arizona demonstrated that the *Verticillium* wilt pathogens, *V. albo-atrum* [*R.A.M.*, 30, p. 367] and *V. dahliae* [29, p. 109; 32, p. 375] remained viable in inoculated cotton seeds for over 17 months and that such seeds germinate. The pathogens were confined to the seed coat and fringe tissue; the embryos were attacked only when wounded. Of 8,330 seeds inoculated in the laboratory by three methods and sown in soil, none yielded diseased plants at maturity. But as all inoculated boll tissue, when moist, can support growth of *Verticillium*, it is considered likely that the seeds might act as disseminating agents. Six months after harvesting, acid-delinted, surface-sterilized seeds from infected locks yielded *Verticillium* in culture. Conidia developed in the pith cavity of dead, mature stalks in the field and in stalks which had stood in water in the laboratory for 28 days. *Gliocladium roseum*, a wound parasite of cotton, is distinguished from *Verticillium* by its good growth on wort agar.

Soprunov (F. F.) & Soprunova (Mme N. Y.). О взаимоотношениях между хищными почвенными грибами и нематодами. [Concerning the relationships between predacious soil fungi and nematodes.]—Микробиология [*Microbiology, Moscow*], 21, 1, pp. 23–30, 1 fig., 1952.

Predacious fungi belonging to the genus *Didymozoophaga*, isolated from the soils of Turkmenistan [*R.A.M.*, 32, p. 125], were studied at the Institute of Malaria and Medical Parasitology, Ashhabad, T.S.S.R. The change from the saprophytic to predacious form of life took place when the environment was changed by the products of nematode activity. The carbonate ion produced in the liquid medium by the nematode is one of the most effective activators inducing the production of the catching apparatus. Deprived of the morphologically differentiated sensitive organs the protoplasm of these fungi becomes highly sensitive to increases in the carbonate ion. By changing the latter predacious fungi can be made to adopt either saprophytic or predacious form of life.

Cruickshank (I. A. M.). **Thermo-chemical seed treatment.**—*Nature, Lond.*, 173, 4396, pp. 217–218, 1 fig., 1954.

Experiments were conducted at the Plant Diseases Division, Auckland, New

Zealand, to determine the effect of carbon tetrachloride [*R.A.M.*, 32, p. 162] on germination of linseed flax [33, p. 154] and control of seed-borne *Sphaerella* [*Mycosphaerella*] *linorum* [23, p. 18] by steeping 10 gm. lots of Golden Viking and Koto seed in a bath maintained at different temperature levels. No mucilaginous sludge developed during the course of treatment and no carbon tetrachloride appeared to be absorbed. The results of germination counts showed significant depression of germination only at 70° and 75° C. for 30 minutes with Golden Viking and 20 minutes with Koto. These treatments also markedly reduced seedling vigour, development being two to three days behind that of untreated seed. No spore germ-tubes were observed after treatment for 20 minutes at 65°, 70°, and 75°, or for 30 minutes at 60° and no fungus cultures were obtained in plate tests of seed treated for 15 minutes at 70° or 75°, 20 minutes at 65°, or 30 minutes at 60°. Untreated samples yielded 14 per cent. infected seed. In a similar experiment with linseed infected with *Polyspora lini* [31, p. 117] no cultures were obtained on plating seed treated for 15 minutes at 70° or 20 minutes at 65°.

It appears from these results that the use of carbon tetrachloride as a material for heat treatment of linseed has two technical advantages over water: the safety limits with respect to germination are wider and no artificial drying of the seed is necessary. On the other hand a specially designed steep for the elimination of fumes and the recovery of carbon tetrachloride vapour emitted during treatment would be required for the efficient operation of a thermo-chemical plant.

Doucette (C. F.). **Botrytis polyblastis on Narcissus in the Pacific Northwest.**—*Plant Dis. Reptr*, 37, 11, pp. 556–557, 1953. [Multilithed.]

Botrytis polyblastis was detected on narcissus [*R.A.M.*, 13, p. 772] during the spring of 1953 in laboratory plots at Sumner, Washington. This is the first general appearance of the disease since 1934 [loc. cit.]. The varieties Rembrandt, Francisca Drake, Nursemaid, Scarlet Leader, Red Cross, White Queen, Golden Sceptre, and King Alfred were highly resistant.

Marshall (B. H.). **Relation of wound periderm in Gladiolus corms to penetration by Fusarium oxysporum f. gladioli.**—*Phytopathology*, 43, 8, pp. 425–431, 1 fig., 1953.

At the Plant Industry Station, Beltsville, Maryland, the author investigated the effect of favourable conditions (95 per cent. relative humidity and a constant temperature of 95° F.) for wound periderm formation on the susceptibility of cut surfaces of Picardy and Corona gladiolus corms to invasion by *Fusarium oxysporum* f. *gladioli* [*R.A.M.*, 33, pp. 83, 230]. A considerable amount of decay occurred in corms inoculated one to four days after placing in the moist chamber, but the fungus failed to penetrate those inoculated after five to seven days' exposure.

The efficiency of pre-storage heat treatments (for which a temperature of 95° [33, p. 29] was selected as the most suitable of several tested), with or without accompanying high relative humidity, was compared with that of immersion in dow B and spergon for the protection of corms against the rot. A large percentage of infection occurred in all the tests, but the corms submitted to high temperature before storage sustained much less damage than those treated with either of the fungicides. The rapid mummification of the dipped corms suggests the presence of latent infections which developed as a sequel to weakening by chemical injury. The longer the period of curing (up to 30 days) before cleaning, the less severe was the rot in all treatments. There was a slight tendency for bruised corms to decay more rapidly than uninjured.

The 'walling-off' of infected areas by a cork barrier reported by Bald in corms cured at 95° (*Bull. N. Amer. Gladiolus Coun.* 26, pp. 107–110, 1951) was not observed in experiments performed at a relative humidity of 95 per cent.

Smith (F. F.) & Brierley (P.). **Grassy-top symptoms in Gladiolus reproduced by experimental inoculation with western Aster yellows virus.**—*Plant Dis. Reptr*, 37, 11, pp. 547–551, 3 figs., 1953. [Multilithed.]

At Beltsville, Maryland, grassy-top symptoms were produced on Picardy gladiolus inoculated after flowering with the western strain of aster yellows virus [*R.A.M.*, 32, p. 433] by means of the vector, *Macrosteles divisus*, reliable evidence of such infection appearing only in the next season. Infection at full flowering or earlier produced current-season symptoms, i.e., early maturity, small corms, and arrested development of the contractile roots. Experimental production of symptoms (shortening of the internodes and small, yellowish leaves) on Jersey Beauty and Unwin's hybrid dahlias was also obtained.

Haasis (F. A.). **Topple disease of Dutch Iris.**—*Plant Dis. Reptr*, 37, 11, pp. 558–559, 2 figs., 1953. [Multilithed.]

A topple disease [cf. *R.A.M.*, 32, p. 679] of the Dutch iris variety Wedgewood was first reported in 1942 on 30 per cent. of 50,000 plants growing in flats at Babylon, Long Island, New York, and in 1952 14 per cent. infection occurred in a greenhouse at Castle Hayne, North Carolina. The disease is characterized by watersoaked tissues in the last internode of the flower stalk, exudation of a viscous liquid, shrinking of the affected tissue, and finally topple of the flower. So far, it has been observed only under greenhouse conditions of forcing during the short days of early winter. The cause is unknown.

Schmidt (Trude). **Die Nelkenschwärze.** [Carnation blackening.]—*Pflanzenarzt*, 6, 12, pp. 7–8, 1 fig., 1953.

This is a popular note on the symptoms and control of carnation ring spot (*Heterosporium echinulatum*) [*Didymellina dianthi*] in Austria [*R.A.M.*, 32, p. 190], where it was rife in 1953. Dense planting, excessive moisture, and unbalanced nitrogenous manuring should be avoided, infected material promptly removed and destroyed, and planting sites changed regularly. Copper-containing sprays are effective against *D. dianthi* [cf. 29, p. 260], the best results having been obtained with 1 per cent. Bordeaux mixture supplemented by a wetter.

Schmidt (Trude). **Alternaria-Blattfleckenkrankheit der Zinnie (Alternaria zinniae Pape) in Österreich.** [*Alternaria* leaf spot disease of Zinnia (*Alternaria zinniae* Pape) in Austria.]—*PflSchBer.*, 11, 1–2, p. 18, 1953. [English summary.]

Alternaria zinniae was observed on zinnia [*R.A.M.*, 31, pp. 239, 594] in Austria for the first time in 1952, producing the familiar round, dark brown, mostly purple-edged lesions, 2 to 10 mm. in diameter, on the leaves of plants in a Viennese market-garden.

Neergaard (P.). **Centrospora root rot of Primula malacoides, a serious soil-borne disease in Denmark.**—*Plant & Soil*, 4, 2, pp. 128–140, 3 figs., 2 diags., 1952.

A serious root rot of *Primula malacoides* caused by *Centrospora acerina* [cf. *R.A.M.*, 25, p. 383; 33, p. 201] destroyed about half the plants in a Danish nursery in one year and has caused annual losses of 12,000 to 25,000 Kr. to growers since 1932. The fungus was isolated consistently from affected roots and its pathogenicity established in inoculation experiments. The main roots were always rotten and contained abundant resting mycelium. The leaves were slightly chlorotic at first; later they softened and wilted and the whole plant collapsed.

In two experiments infection was reduced by steam sterilization of the soil from 7 and 20 per cent. to 0·6 and 3 per cent., respectively. Dead and diseased plants

should be destroyed. The pathogen was not found in over 50 seed lots examined over a period of five years.

'Rust' is on the increase.—*Comm. Gr., 1954*, 3034, p. 361, 1954.

Chrysanthemum rust [*Puccinia chrysanthemi*: *R.A.M.*, 31, p. 384] is reported to be increasing steadily in Britain, the increase coinciding with the discontinuance of hot-water treatment and the widespread use of parathion against eelworms. During the last two or three seasons the incidence of rust has been the highest for years and some varieties, e.g., Friendly Rival, Favourite, and Balcombe Perfection, were more susceptible than others. Thiram sprays are very effective in preventing rust infection and should be applied before attack. Later on, when the plants are housed, fumigation by sulphur vaporizers is more convenient.

Leyendecker (P. J.). **Ornamental flowering plants naturally infected with the curly-top virus in southern New Mexico.**—*Plant Dis. Reptr*, 37, 11, pp. 552–554, 1953. [Multilithed.]

During field investigations carried out in 1953 by the Department of Biology, New Mexico Agricultural Experiment Station, *Campanula calycanthema*, *C. medium*, *C. persicifolia*, *Dianthus latifolius*, *Lychnis chalcedonica*, *Chrysanthemum maximum*, *Papaver orientale*, *Aquilegia* sp., and *Digitalis purpurea* were all found to be highly susceptible to beet curly top virus in a mixed planting of ornamentals surrounded by the susceptible host, *Atriplex canescens*.

Ark (P. A.). **Some destructive diseases of Cymbidiums.**—*Orchid J.*, 2, 9, pp. 430–432, 3 pl., 1953.

A serious soft rot of *Cymbidium* pseudobulbs, due to a bacterial pathogen [cf. *R.A.M.*, 30, p. 372], is being studied at California University. Mature plants only are attacked, with a mortality rate of up to 90 per cent. The only method of control is by careful sanitation.

Where *Cymbidium* orchids are grown in too moist conditions, black rot of the pseudobulbs due to *Pythium ultimum* [cf. 32, p. 432] is a common disease. Preliminary trials indicate that black rot may be controlled by spraying with 0·1 per cent. thiram.

A rare soil-borne disease of *Cymbidium*, *Sclerotium rolfsii* [21, p. 202], attacks and rots the leaf bases, becoming serious once it is established in potting soils.

Sackston (W. E.). **A species of Itersonilia pathogenic on Sunflowers.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 22, 1953.

A species of *Itersonilia* [cf. *R.A.M.*, 31, p. 416] was isolated from lesions on the cotyledons and hypocotyls of sunflower seedlings exposed to infection by *Puccinia helianthi* at the Laboratory of Plant Pathology, Winnipeg, Canada. The fungus had clamp-connexions at most of the septa and produced hyaline, asymmetric ballistospores. Lesions similar to those from which the fungus was isolated were produced on sunflower cotyledons and hypocotyls inoculated with pure cultures of the organism. The fungus was reisolated from inoculated leaves of maize, carrot, cucumber, flax, and oats, in addition to sunflower.

Maramorosch (K.). **A new leafhopper-borne plant disease from western Europe.**—*Plant Dis. Reptr*, 37, 12, pp. 612–613, 2 figs., 1953. [Multilithed.]

In preliminary greenhouse experiments at Wageningen, Holland, a previously unknown virus disease of crimson clover (*Trifolium incarnatum*) was transmitted by leafhoppers (*Euscelis plebejus* ssp. *plebejus*) collected from grass in a cherry

orchard near Maastricht where outbreaks of 'Eckelrade' disease [*R.A.M.*, 31, p. 560] had been reported. The clover leaves developed enlarged veins and deep ridges on the upper surface and enations on the lower; later formed leaves were small and chlorotic, with short petioles. No symptoms were found on clover in the orchard. Further studies are contemplated.

Brakke (M. K.), Maramorosch (K.), & Black (L. M.). **Properties of the wound-tumour virus.**—*Phytopathology*, 43, 7, pp. 387–390, 1953.

At the Brooklyn Botanic Garden, New York, injection of leafhoppers (*Agallia constricta*) was used as the basis of a bioassay for the determination of certain attributes of the clover wound-tumour [big vein] virus [*R.A.M.*, 32, p. 662]. Extracts from crimson clover and the insect were infective at dilutions of 10^{-4} and 10^{-5}, respectively. Dried at 0° C., the virus survived storage for a year at the same temperature. Crude, neutral extracts withstood ten minutes' heating at 50° but not at 60° without loss of virulence. An hour's storage at 0° between pH 4 and 9 did not impair the infectivity of the extracts, which was lost, however, under more acid or more alkaline conditions. The virus traversed filters that retained *Serratia marcescens* without reduction of toxicity.

Schicke (P.). **Virosen am Inkarnatklee (Trifolium incarnatum L.).** [Viroses of Crimson Clover (*Trifolium incarnatum* L.).]—*Arch. ges. Virusforsch.*, 5, 3, pp. 169–207, 13 figs., 3 diags., 4 graphs, 1953.

Two viruses affecting crimson clover in the Lower Rhine Valley, Germany, were identified with virtual certainty, on the basis of their symptomatology, transmissibility, persistence, and host range, as pea enation mosaic and pea mosaic [*R.A.M.*, 31, pp. 313, 587]. The former produces on the leaves, after a 13-day incubation period, vein-clearing and speckling, which become necrotic, and on the under side enations along the veins and bordering the necrotic areas. A period of at least four hours must elapse after the acquisition of the virus by *Acyrthosiphon onobrychidis* [*A. pisum*] before transmission can be effected to pea and crimson clover. The aphids remain infective for seven days or more. The predominant symptoms of pea mosaic, appearing after an incubation period of eight to nine days (or longer at low temperatures), are an initial vein-clearing followed by mosaic mottling. The virus is transmissible to crimson and alsike clover, broad bean, and pea immediately after acquisition, but only within the next half-hour, by *A. pisum*, *Cerosipha gossypii*, and *Doralis* [*Aphis*] *fabae*.

Neither virus is of economic importance to clover, except possibly in valuable breeding plots, but their overwintering on crimson clover is significant in view of the damage they inflict on broad beans and peas. In an experiment at the Bonn Phytopathological Institute in 1951 autumn infection was prevented by dense sowing on 4th September in special pots cut out of peat sods, followed by fortnightly spraying with 0·05 per cent. systox emulsion until transplanting on 6th November.

Røed (H.). **Mitrula sclerotiorum Rostr. and its relation to Sclerotinia trifoliorum Erikss.**—*Acta Agric. scand.*, 4, 1, pp. 78–84, 3 figs., 1954.

Following a review of previous references to *Mitrula sclerotiorum*, recent observations on the fungus in Norway [*R.A.M.*, 32, p. 383] are described. *M. sclerotiorum* has invariably been found in association with *Sclerotinia trifoliorum*, giving rise to the supposition that a proportion of the damage on clover and other legumes usually attributed to the latter species is actually due to the former. In one of the author's specimens, however, a single sclerotium of the *S. trifoliorum* type produced apothecia of both species, thereby corroborating Ekstrand's opinion that *M. sclerotiorum* is not a parasite on clover but on the sclerotia of *S. trifoliorum* [18, p. 299].

In culture on malt agar *M. sclerotiorum* grows very slowly, a radial increment of about 1·3 mm. per 10 days being recorded. The round to oval conidia, averaging 3 to 4 μ in diameter, are mostly formed in small bundles on irregularly branched conidiophores, and are enclosed in bottle- or ampulla-shaped sacs, 15 to 18 by 3 to 5 μ, in which a tubiform aperture develops at the apex for the extrusion of the conidia one by one. Older cultures sometimes contain reddish-brown, flat, somewhat cartilaginous cushions resembling sclerotia. In its endogenous mode of conidial formation *M. sclerotiorum* presents close analogies with *Cadophora*. Further studies on the taxonomy of *M. sclerotiorum* are in progress.

Hashioka (Y.) & Suzuki (Y.). **Sclerotinia rot of Chinese Milk Vetch, with special reference to the strains of the causal fungus.**—*Contr. Hokuriku agric. Exp. Sta.*, 8 pp., 7 graphs, 1 map, 1952. [Mimeographed.]

Overwintering of *Astragalus sinicus*, the chief winter crop of the paddy fields in the snowy region of Japan, especially in the Hokuriku area, is frequently disturbed by fungal attack induced by rain and snow. The most destructive of these rotting fungi is *Sclerotinia trifoliorum* [*R.A.M.*, 9, p. 595], though certain species of *Pythium* may also cause snow rot.

Studies on the growth-temperature range of many different strains of *S. trifoliorum* [17, pp. 128, 699; 33, p. 233] isolated from *A. sinicus* in different climatic regions of Japan demonstrated that in general the optimum temperature for sclerotial formation lies between 20° and 25° C., though it varies widely between the strains. At 0° and 30° no sclerotia formed in any strain. Mycelial development was best in all strains at 20°. At 0° two strains which were most vigorous at the higher temperatures grew very poorly, though others (from cold, snowy regions) gave good mycelial development. On the whole, the pathogenicity of the different strains at any given temperature was governed chiefly by the rate of mycelial growth at that temperature. There appears to be little difference in varietal susceptibility in *A. sinicus*. The density of plant growth during the rainy part of the autumn and at the beginning of the snowy season governs the initial amount of rot injury; it was slighter the later the sowing time and the thinner the seeding, but by the end of March all the plots had about the same amount of rot, irrespective of sowing density or date. It is difficult to reduce rot injury by improved cultural practices when sclerotia are thickly scattered in the soil and the plants are covered with deep snow for more than three months.

Pythium snow rot occurs in both upland and lowland fields, especially those that are ill-drained. Just after snow-break the rotted leaves appear as soft, wet, dull greyish-green remains, drying to a greyish-white, papery texture. *S. trifoliorum* causes the leaves to become completely disorganized; only the decayed stems and petioles are left as reddish-brown fibrous strands. From field observations varieties of *A. sinicus* from cold, northern regions appear to be resistant to *Pythium* snow rot, whereas those from southern areas are completely susceptible and almost unable to overwinter under deep snow.

Millikan (C. R.). **Relative effects of zinc and copper deficiencies on Lucerne and subterranean Clover.**—*Aust. J. biol. Sci.*, 6, 2, pp. 164–177, 7 pl., 1953.

Sand culture experiments were carried out at the Biology Branch, Department of Agriculture, Victoria, in 1951 for the study of zinc and copper deficiencies in subterranean clover (var. Dwalganup) [*R.A.M.*, 32, p. 563; 33, p. 235] and lucerne (var. Hunter River). Zinc deficiency caused a greater reduction of top growth in clover than in lucerne, top growth in both species being more affected than root growth. Copper deficiency affected lucerne more than clover. Reduced light intensity (50 per cent. for the first eight weeks) significantly lessened the reduction

in growth due to the absence of zinc under full light conditions. Zinc deficiency increased the copper concentration in both species. In the absence of copper, subterranean clover produced no flowers. It is suggested that excretions from lucerne roots have the property of increasing the availability of soil zinc, not only for their own use but for the roots of other plants.

Korean Lespedeza.—*Seed World*, 73, 6, p. 34, 1953.

Korean *Lespedeza*, which covers some 10,000,000 acres in Missouri, is threatened by bacterial wilt [*Xanthomonas lespedezae*: *R.A.M.*, 28, p. 18]. Two new resistant strains, 31,057 (an early type for more northerly areas) and 31,852, have been developed at the Missouri Experiment Station and it is hoped that seed will be available in two years. Among the existing resistant varieties [cf. 26, p. 494] Climax appears to be suitable for the south.

New Sudangrass resists leaf blight.—*Seed World*, 73, 11, p. 14, 1953.

Seed is available of Greenleaf, a new Sudan grass variety resistant to *Helminthosporium* leaf blight [*H. turcicum*: *R.A.M.*, 32, p. 132], selected by R. C. Pickett, Kansas State College. It is low in the chemical producing prussic acid poisoning in cattle.

Meiners (J. P.) & Dietz (S. M.). **Seed treatment trials for control of head smut in Mountain Brome in 1953.**—*Plant Dis. Reptr*, 37, 12, pp. 595–596, 1953. [Multilithed.]

The results of the 1953 seed treatment trial at Pullman, Washington, for the control of head smut (*Ustilago bullata*) on Bromar mountain brome grass (*Bromus marginatus*) confirmed those of the previous year [*R.A.M.*, 32, p. 630]. Ceresan M slurry and dust and panogen (concentrated or dilute), both at 1 oz. per bush. and not less than 1 gal. of slurry to 16 bush. of seed, are recommended; the former eliminated infection, the latter reduced it to less than 1 per cent.

Louw (A. J.). **Spraying experiments against Apple scab (Venturia inaequalis (Cke.) Wint.) in the winter-rainfall area of the Cape Province.**—*Sci. Bull. Dep. Agric. S. Afr.* 315, 32 pp., 3 pl., 3 graphs, 1952.

In view of the lack of experimental data on the control of apple scab (*Venturia inaequalis*) in the winter rainfall area of the Cape Province [*R.A.M.*, 31, p. 334], a series of spray trials was carried out during the three seasons from 1942 to 1945. Experiments at Ceres during the 1942–3 season demonstrated effective control by a summer spray schedule consisting of three applications of lime-sulphur at the green tip (1–40), pink bud (1–75), and blossom (1–100) stages, respectively, and two post-blossom applications (1–100) at fortnightly intervals. The pink bud and blossom sprays were particularly effective since they coincided with climatic conditions especially favourable for infection. In another test five-spray schedules of Bordeaux mixture (5–5–100), copper oxychloride (½ per cent.), and lime-sulphur gave 0·6, 0·7, and 0·3 per cent. scabbed leaves, respectively, against 49·8 per cent. for the untreated. The copper fungicides, however, caused severe leaf injury.

The individual sprays of a four-application schedule were evaluated according to the Geneva system at Ceres in 1943–4 [27, p. 326]. Pre-blossom sprays prevented primary infection and were essential for controlling fruit scab. In tests employing different concentrations of lime-sulphur its effectiveness in controlling fruit scab decreased systematically with the weakening of the solution from 1–100 to 1–200. This result was confirmed at Elgin in 1944–5, though in this season lime-sulphur was still very effective at 1–300. A combined scab-codling moth (*Carpocapsa* [*Cydia*] *pomonella*) schedule consisting of lime-sulphur and lead arsenate caused appreciable leaf injury, which decreased as this combination was replaced by a

wettable sulphur-fixed nicotine treatment. A schedule including lime-sulphur for the pre-blossom and wettable sulphur and fixed nicotine for the post-blossom period gave the best quality fruit.

It was concluded that early ploughing in of old leaves is a valuable adjunct to the spray programme. Effective scab control with minimum spray damage may be obtained in most years by using 1–100 lime sulphur during the pre-blossom period and elemental sulphurs for post-blossom applications.

Von Oppenfeld (H.), Boynton (D.), Brann (J. L.), Burrell (A. B.), & Shepardson (E. S.). **Cost and effectiveness of different insect and disease control practices in New York Apple orchards.**—*Bull. Cornell agric. Exp. Sta.* 886, 75 pp., 20 figs., 8 graphs, 1 map, 1952.

The detailed records presented here on the cost of spraying for control of insect pests and scab [*Venturia inaequalis*: *R.A.M.*, 32, p. 489] and for fruit set in relation to materials, operation, and equipment, including dilute and concentrate air blast machines and high pressure sprayers with guns and/or brooms and with masts or spray heads, are based on information obtained from over a 100 commercial apple orchards in western New York State and the Hudson Valley in 1949–50. Insect and scab control was less satisfactory on trees over 20 ft. high or with dense foliage, regardless of machinery. Very rapid output (over 1,200 gals. per hour) appeared sometimes to be associated with inferior control, due, possibly, to excessive rates of travel during spraying. Growers who minimized primary infection by scab by timely and thorough spraying in the spring and early summer used fewer applications and less spray than those who allowed the disease to become serious early in the season. Organic fungicides were not, on the whole, more effective against scab than sulphur. Of the $98 average cost of spraying per acre, 63 per cent. covered spray materials, 10 labour, 7 tractor power, and 20 spray equipment. The expenses per acre involved in using airblast equipment were lower for labour and higher for machinery than those of high pressure apparatus, but the ranges in cost were much greater within each machinery class than between the classes. The cost of spray materials varied from under $30 per acre to over $120, the higher figures being for large numbers of sprays, high total gallonage, and expensive organic fungicides, while the price per bush. of marketable fruit ranged from less than $0·12 to more than $1·89.

No general specifications can be recommended for reducing the cost of spraying, since the type of orchard and its particular problems must be considered. All economic spraying programmes depend on high yields and a high degree of pest control.

Mujica (R.). **Combinación de fungicidas erradicantes y protectores para el control de la sarna o Venturia del Manzano.** [Combination of eradicant and protective fungicides for the control of scab or *Venturia* of Apple.]—*Agricultura téc., Santiago*, 13, 1, pp. 32–39, 1953. [English summary.]

Apple scab (*Venturia inaequalis*) is stated to develop on an epiphytotic scale in southern Chile [C.M.I. map No. 120], where the old leaves buried in the sandy soil in winter ploughing operations constitute a prolific source of primary inoculum in the following spring, indicating the advisability of discontinuing this practice. In 1951 a block of 25 trees in a 30-year-old Yellow Newtown orchard near Linares was given a ground spray of 0·5 per cent. elgetol [cf. *R.A.M.*, 29, p. 101 *et passim*] at 3,500 l. per ha. while a corresponding block was left untreated. Foliar sprays were applied to both blocks (1) at the inception of growth, (2) at petal-fall, and (3) after flowering, groups of five trees being sprayed with 2·5 per cent. basicop, cuproxen, fermate (each at 2 per cent.), and lime-sulphur (0·8 per cent. Baumé), and five left untreated.

Statistical analyses of the results demonstrated the efficacy of the combined treatment. Lime-sulphur was inferior to the other protectants, the differences between which were not significant. Soil treatment alone reduced the incidence of fruit infection from 43·75 to 9·41 per cent., while the percentages for the trees treated with combinations of elgetol and (*a*) basicop, (*b*) cuproxen, and (*c*) fermate were 1·98, 2·73, and 2·07, respectively.

Vergara Castillo (C.). **Un aporte al estudio de campo y de laboratorio del hongo Nectria galligena Bres.** [A contribution to the field and laboratory study of the fungus *Nectria galligena* Bres.]—*Agricultura téc., Santiago*, 13, 1, pp. 62–85, 3 figs., 1953. [English summary.]

Much of this information on European apple canker caused by *Nectria galligena*, one of the most serious apple diseases in Chile, especially in the southern regions, has been noticed from another source [*R.A.M.*, 31, p. 373]. A survey of the most important orchards in the district extending southwards from the Bío-Bío River revealed maximum prevalence in Delicious, Yellow Newtown, the Reinette group (except Pippin), Puchacay, and Gravenstein, while a measure of resistance was shown by Hoover (a sour or wild type useful solely at a stock), Pippin, White Winter Pearmain, and Candelaria.

Race A or San Clemente [loc. cit.] on potato dextrose agar produces mycelium of a cottony consistency, the submerged portion turning coffee-coloured. Ten days after transference to an incubator at 20° C. the colony covers the entire dish. Race B or Osoruo also produces a cottony, white colony at first, the aerial portion assuming a whitish-yellow and the submerged a vivid yellow coloration by the 10th to the 15th day in culture. Race A was referred to *Fusarium* sp. and race B to *F.* [*Cylindrocarpon*] *willkommii* [3, p. 729]. In inoculation experiments on the Red Astrakhan variety B was more pathogenic than A.

In southern Chile perithecial formation occurs principally during the period from May to August and is not arrested by cold weather, trees bearing perithecia having been found at the foot of the Cordilleras, where winter temperatures of 2° to 3° are common. The disease appears to be favoured by a high degree of soil acidity. Other factors predisposing to infection by *N. galligena* are examined in detail and include unduly dense planting, thereby maintaining a humid atmosphere in the orchard and expediting the spread of the pathogen by way of the interlacing branches; infestation of the trees by the woolly aphid (*Eriosoma lanigerum*) and other insects which inflict injuries facilitating penetration by the fungus; and the presence in the subsoil of sheets of water impeding the development of a healthy root system.

The question of control is treated at some length on the basis of local experience and information from foreign sources. For many growers the labour involved in cutting out individual cankers is impracticable, and other preventive methods should be adopted, e.g., the use of the sour or wild apple (raised from seed) as a stock; and spraying with 2 per cent. Bordeaux mixture, fermate, or dithane shortly before leaf-fall in the autumn and at half-strength in the spring. For a breeding programme to secure resistant varieties material of Bulmer's Norman, Transparent du Croncel, and Sweet Alford has been imported from the Plant Industry Station, Beltsville, Maryland, and is undergoing quarantine prior to grafting on sour apple stocks and inoculation with *N. galligena* to confirm resistance in local surroundings.

Sprague (R.). **Apple powdery mildew spray trials, 1953.**—*Plant Dis. Reptr*, 37, 12, pp. 601–603, 1953. [Multilithed.]

In further spray trials for the control of apple powdery mildew (*Podosphaera leucotricha*) on Black Jonathan, standard Jonathan, and other varieties at

Wenatchee, Washington [*R.A.M.*, 30, p. 475], karathane [iscothan] (1 lb. per 100 gals. water) was again very promising, phygon at the same rate was effective but expensive, colsul [31, p. 247] appeared promising at 3 lb., and on small trees some control was given by phenamin special W.E and phenamin technical W.E. (both at 2 pints), four or five applications being made in each case.

Blumer (S.). **Viruskrankheiten am Steinobst.** [Virus diseases of stone fruits.]—*Schweiz. landw. Mh.*, 31, 9, pp. 365–375, 5 figs., 1953.

This is a summary of information already presented from other sources on the viroses of stone fruits, the cherry Pfeffinger disease [*R.A.M.*, 32, p. 490], prune [plum] dwarf, widely distributed on Fellenberg prune, and band mosaic (line pattern) [31, p. 245] on plum.

Josifović (M.). Проблем шарке Шљиве у ФНРЈ са фитопатолошког гледишта. [The problem of the Plum pox disease in F.P.R.Y. from the phytopathological point of view.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 11, pp. 63–68, 1952.

A brief description is given of the plum pox disease [*R.A.M.*, 31, p. 613 and following abstracts and above, p. 280] said to be caused by *Prunus* virus 7 [cherry mottle leaf virus] in Yugoslavia. It is neither soil- nor seed-borne and attacks, besides plums, the cultivated *Prunus myrobalana* [? *P. cerasifera*], *P. insititia*, *P. triloba*, and apricots. The virus is inactivated at about 66° C. and is transmitted by the aphid, *Anuraphis* [*Brachycaudus*] *helichrysi*, which is more prevalent at lower altitudes. The main source of the spread, however, is due to grafting from diseased trees. So far there is no known control but immediate removal of diseased trees, a rigid phytosanitary control of seedling multiplication, planting healthy material in uninfested orchards or those where all the diseased trees have been removed, an efficient quarantine service to prevent transport of the diseased plants into uninfested areas, and the development of resistant varieties from acceptable commercial varieties, such as Požegača, Bilska, and Early Mirabella, the last two of which usually produce healthy fruit, though susceptible.

Niketić (M. J.). Проблем шарке Шљиве у ФНРЈ са воћарског гледишта. [The problem of the Plum pox disease in the F.P.R.Y. from the orchard point of view.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 11, pp. 69–72, 1952.

This paper discusses the plum pox disease [cherry mottle leaf virus: see preceding and following abstracts] situation in orchards in various parts of Yugoslavia and the best means of securing the elimination of diseased trees.

Todorović (S. B.). Проблем шарке Шљиве. [The problem of the Plum pox disease.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 11, pp. 57–62, 1952.

In this paper, read before the Council of Agriculture and Forestry, Yugoslavia, in March, 1952, the author summarizes the present situation of the plum-growing industry, which is seriously threatened by the plum pox disease [cherry mottle leaf virus: see preceding and next abstracts]. It is particularly severe in the east near the Bulgarian frontier and further south near the Greek frontier and has also been found in Macedonia and Croatia; it is causing complete arrest of plum cultivation in many localities. In Serbia in 1948 some 50 per cent. of the trees were infected. Plums constitute 80 per cent. of the fruit-growing industry in Yugoslavia and losses incurred by this disease present a serious economic problem. So far no resistant varieties are known. Means of checking the spread of the disease and organized control measures are all carefully considered.

Pobegajlo (I.). Предлог за сузбијање шарке Шљиве. [A suggestion for the control of Plum pox disease.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 11, pp. 73–77, 1952.

In addition to the control measures already described for plum pox disease [cherry mottle leaf virus: see preceding abstracts] in Yugoslavia, suggestions are made for a closer survey of the entire country as well as the establishment of testing nurseries and a qualified advisory commission for the study of the disease and its control.

Guba (E. F.). **Large leaf spot and canker of Peach caused by the fungus Fusicoccum amygdali Delacr.**—*Plant Dis. Reptr*, 37, 11, pp. 560–564, 4 figs., 1953. [Multilithed.]

Fusicoccum amygdali [cf. *R.A.M.*, 27, p. 569; 33, p. 37] is prevalent in peach orchards in the North Atlantic Coastal Area of the United States, causing twig canker and producing large, brown, irregular or circular, often zonate leaf spots which partly fall out. The varieties June Elberta, Belle of Georgia, Summercrest, Raritan Rose, Eclipse, Cumberland, Golden Jubilee, Jerseyland, and Greensboro are all susceptible. The fungus overwinters in both cankers and infected leaves. In Massachusetts serious infections take place in September and October, cankers appearing with or soon after the new spring growth. Buds are usually killed before any growth takes place, but sometimes the shoots may develop considerably and even survive the first season before they become girdled and die. Gummosis is a characteristic symptom.

Control measures include fungicidal protection throughout the season (until the middle of October), starting with lime-sulphur at delayed dormant, ferbam or combined ferbam and phygon with or without wettable sulphur until early July, followed by captan alone or with wettable sulphur. The removal of diseased branches during the dormant season and clean-up pruning in May and June are important; so are cultural practices promoting new growth.

Dunegan (J. C.), Wilson (R. A.), & Morris (W. T.). **Effects of terramycin on Peach trees affected with bacterial spot.**—*Plant Dis. Reptr*, 37, 12, pp. 604–605, 1953. [Multilithed.]

At Beltsville, Maryland, injections of terramycin into the trunks of Sunhigh, Rio Oso Gem, and Valiant peach trees at the end of April, 1953, reduced subsequent defoliation and leaf and fruit infection caused by bacterial spot (*Xanthomonas pruni*) [*R.A.M.*, 32, p. 322], the effect persisting throughout the year. The leaves developed a yellow-green colour. More extensive experiments are required to confirm these results before the value of the treatment can be assessed.

Yarwood (C. E.). **Apricot powdery mildew from Rose and Peach.**—*Bull. Dep. Agric. Calif.*, 41, 1, pp. 19–25, 1 fig., 1 graph, 1952.

During investigations in California over a period of five years it was found that all infections of apricot fruits by the powdery mildew, *Sphaerotheca pannosa* [cf. *R.A.M.*, 10, pp. 247, 436], were associated with mildew on adjacent rose trees [31, p. 248; 33, p. 211], particularly on *Rosa banksiae*. Few, if any, occurred after April. Infected fruits are used for drying but not for canning. The incidence varied inversely with the distance between the roses and apricots and the disease did not appear to spread from fruit to fruit. Apricot leaf infection by *S. pannosa* from *R. banksiae* and from peach [30, p. 52] resulted in large necrotic lesions; when the source was the rose variety Dorothy Perkins the lesions were small. The most common powdery mildew infections on apricot leaves were the large, non-necrotic lesions produced by *Podosphaera* [*clandestina* var.] *tridactyla* [13, p. 127; cf. 33, p. 160], which overwinters as perithecia and develops only on apricot.

Frazier (N. W.). **A latent virus of Fragaria vesca.**—*Plant Dis. Reptr*, 37, 12, pp. 606–608, 1 fig., 1953. [Multilithed.]

At the University of California, Berkeley, a latent virus was detected in the East Malling clone of *Fragaria vesca* and in *F. bracteata* originating in California. It caused no distinct symptoms on either of these two hosts or on strawberry, but its presence intensified the symptoms of other viruses (including a mild mottle virus [*R.A.M.*, 32, p. 573]). In combination with other viruses, the latent virus from *F. bracteata* caused a more severe disease than did that from *F. vesca*. On the basis of this difference the virus from *F. vesca* is designated as strain A and that from *F. bracteata* as strain B of the strawberry latent virus. The virus has been transmitted only by grafting.

Mather (S. M.). **Strawberry plant certification and registration in California.**—*Bull. Dep. Agric. Calif.*, 41, 1, pp. 3–8, 3 figs., 1952.

Information is given about the strawberry certification and registration programme adopted in 1949 at the request of growers in California. It requires low virus tolerance [*R.A.M.*, 32, p. 683] in certified stock, freedom from certain nematodes and red core disease [*Phytophthora fragariae*: 32, p. 633], intensive roguing, isolation, and plant indexing. Certification is based on a two-year inspection period. In 1951 five index beds, one of Marshall [31, p. 338] and two each of Shasta and Lassen, were entered in the registration programme.

Miller (P. W.). **Effect of hot-water treatment of virus-infected Strawberry plants and viruses.**—*Plant Dis. Reptr*, 37, 12, pp. 609–611, 1953. [Multilithed.]

In experiments conducted by the Oregon Agricultural Experiment Station and the United States Bureau of Plant Industry, Corvallis, Oregon, the components of the strawberry virus complex were found to be relatively highly thermostable when infected plants were given hot-water treatment [cf. *R.A.M.*, 32, p. 437; 33, p. 96]. Limited virus inactivation was obtained, however, between 109° to 120° F. for certain immersion periods varying from half-an-hour to seven hours. Of the 57 plants in which the viruses were inactivated 31 were eventually killed by the treatment, while the remaining 26 were still virus-free four to eight months later. The inconsistencies in both plant survival and virus inactivation, e.g., at 123° all plants treated for 1 hour or less were killed, whereas after 2 hours some had survived and the viruses were still alive, may be due to the presence in different plants of various virus components, or mixtures thereof, with different thermal death points. Dormant plants and the varieties Redrich and Brightmore generally withstood higher temperatures for longer periods than vigorously growing ones and the varieties Marshall and Northwest.

The hot-water treatment is not recommended for commercial use because of the high plant fatality rate.

Castellani (E.). **Osservazioni e ricerche sull' 'occhio di pavone' dell' Olivo in Sardegna. 1°. La caduta anticipata delle foglie.** [Observations and researches on 'peacock's eye' of Olive in Sardinia. 1. Premature leaf fall.]—Reprinted from *Olearia, 1952*, 5–6, 10 pp., 2 figs., 4 graphs, 1952.

Studies on leaf spot of olives in Sardinia caused by *Cycloconium oleaginum* [*R.A.M.*, 28, p. 467; 31, p. 616] were conducted at Sa Funtana, near Dolianova (Campidano di Cagliari) from November, 1950, to March, 1952. The disease was shown to harm the plant in three ways: (*a*) the premature leaf fall acted directly by diminishing food synthesis, and indirectly by affecting the opening of the vegetative buds rather than the flower buds; (*b*) affected leaves transpired more and

absorbed more organic substances, but photosynthesis was reduced; and (*c*) translocation from the affected leaves to the branches was obstructed.

Verona (O.). **Notizie sopra una dannosa micosi delle Olive.** [Information on a destructive fungus disease of Olives.]—*Boll. tec. Ist. Pat. veg. Pisa* 5, 8 pp., 4 figs., 1952.

As olives in the province of Livorno were attacked more severely than usual by *Sphaeropsis* (or *Macrophoma*) *dalmatica* [*R.A.M.*, 30, p. 235] recently the author describes the symptoms of the disease, the morphology and dissemination of the parasite, the damage incurred, and control. Since the midge, *Prolasioptera berlesiana*, deposits spores of the fungus together with one of its eggs, the larva from which preys on grubs of *Dacus oleae*, control must be effected without interfering with this valuable biological control. The oil from diseased and healthy sources should be kept separate.

Stover (R. H.), Thornton (N. C.), & Dunlap (V. C.). **Flood-fallowing for eradication of Fusarium oxysporum f. cubense : I. Effect of flooding on fungus flora of clay loam soils in Ulna Valley, Honduras.**—*Soil Sci.*, 76, 3, pp. 225–238, 1 fig., 3 graphs, 1953.

Flooding of banana land for the eradication of *Fusarium oxysporum* f. [var.] *cubense* [*R.A.M.*, 33, p. 213] in Honduras [32, p. 634] was instituted by the United Fruit Company in 1939 and involves submergence under 2 to 5 ft. of water for periods of up to six months before drainage and replanting. The operation causes a reduction of at least 50 per cent. in the numbers of indigenous soil fungi during the first 35 days, while at least 85 per cent. of the *Fusarium* group are eradicated in the course of 40 days. At the end of two months the fungi of the submerged soil are largely migrants entering with the water, which is often laden with silt. Drainage is followed by an immediate and rapid rise in the numbers of soil fungi, which reaches a climax between the 30th and 60th day. A six- to sevenfold increase in the *Fusarium* population was recorded after 30 days, followed by an even greater rise between the 40th and 80th days.

Brentzel (W. E.). **Seed treatments.**—*Bull. N. Dak. agric. Exp. Sta.* 376, pp. 3–25, 11 figs., 2 diags., 1952.

From the results of tests carried out over a period of several years at the North Dakota Agricultural Experiment Station information is presented on some materials which have been found effective for the seed treatment of flax [cf. above, p. 296], soy-beans, peas, field and Lima beans [*Phaseolus vulgaris* and *P. lunatus*], and some cereal and forage crops. In one year only setrete gave excellent control of, and mycon was satisfactory against, covered smut of wheat [*Tilletia* spp.: see above, p. 287], oat smuts [*Ustilago kolleri* and *U. avenae*: loc. cit.], and barley loose smuts [*U. hordei* and *U. nigra*: *R.A.M.*, 32, p. 549]. Kindred or L barley showed considerable resistance to spot blotch [*Helminthosporium sativum*: 32, p. 629]. Satisfactory control of millet [*Setaria italica* and *Panicum miliaceum*] smuts [*U. crameri* and *Sphacelotheca destruens*: 32, p. 372] was obtained with new improved ceresan and ceresan M dust, both at ½ oz. per bush. of seed. Germination of lucerne was improved considerably by seed treatment, particularly with arasan (8 oz. per 100 lb. seed) and phygon (4 oz.). Similar results were obtained with arasan, phygon, and spergon (8 oz.) on reed canary grass [*Phalaris arundinacea*] and crested wheat grass [*Agropyron cristatum*]. In the case of the latter arasan increased germination from 5 to 20 per cent. and mycon (8 oz.) was also effective. Both these fungicides improved sweet clover stands, sometimes from 10 to 50 per cent. Brome grass (*Bromus* sp.) proved less responsive to seed treatment than other grasses.

Mercury treatments appear to be more difficult to use properly on grass seeds than the non-mercurials.

JACKS (H.). **Evaluation of plant therapeutants.**—*Orchard. N.Z.*, 25, pp. 5, 7, 9, 11, 13, 1952.

In this summary of lectures on the evaluation of plant therapeutants for certification, given at growers' meetings in various parts of New Zealand, the results of experiments with newer compounds [*R.A.M.*, 33, pp. 63, 165] are briefly reviewed. Materials based on ferbam and thiram (2 lb. in 100 gals.) were effective against apple black spot [*Venturia inaequalis*: 31, p. 247; 33, p. 140] and bitter rot [*Glomerella cingulata*: loc. cit.], the former being similarly effective against rose black spot [*Diplocarpon rosae*: 31, pp. 185, 208] and the latter against pear black spot [*V. pirina*: 26, p. 231] and tomato leaf mould [*Cladosporium fulvum*: 31, p. 321; 33, p. 140]. Thiram for pre-harvest sprays and phygon (1 lb.), applied not too near the harvest to avoid blemishing the fruit, both gave effective control of peach brown rot [*Sclerotinia fructicola*: loc. cit.] without leaving any toxic residue. Both, however, can cause skin irritation to susceptible persons.

Successful control of *V. inaequalis* was also obtained with venturicide, ascospray (2 lb.), and puratized (¾ pt.) when applied at flowering and for the first cover spray only, followed by the usual sulphur sprays. Similarly, mercurated winter fungicides [28, p. 378], included in the usual spray schedule, and phygon (2 lb.), both applied at the dormant stage, gave control comparable with Bordeaux mixture.

KLÖPPING (H. L.) & VAN DER KERK (G. J. M.). **Investigations on organic fungicides. IV. Chemical constitution and fungistatic activity of dithiocarbamates, thiram sulphides and structurally related compounds. V. Chemical constitution and fungistatic activity of aliphatic bisdithiocarbamates and isothiocyanates.**—*Rec. Trav. chim. Pays-Bas*, 70, 11, pp. 917–939, 949–961, 1951.

In further studies in this series made at the Institute for Organic Chemistry, Utrecht, Holland [cf. *R.A.M.*, 31, pp. 193, 392], the fungistatic activity of the compounds investigated was determined by means of the roll-culture technique against spores of *Botrytis cinerea*, *Penicillium italicum*, *Aspergillus niger*, and *Rhizopus nigricans* [*R. stolonifer*]. Of the thiuramdisulphides, thiram and the dicyclopentamethylene derivatives were the most active, while the activity of the lower dialkyldithiocarbamates was of the same order as the corresponding thiuramdisulphides. Replacement of the lower dialkylamino groups by the alkyl, alkoxy, phenyl, and alkyl mercapto groups and substitutions into these groups lowered their activity. In the thiuramsulphides optimum activity occurred at two sulphur atoms in the sulphide linkage. Substitution of these atoms by NH groups or oxygen atoms in various ways showed that neither the sulphide linkage nor the C = S groups as such can be regarded as responsible for the very high activity of the lower thiuramsulphides and dithiocarbamates, which seemed to reside in the —C(=S)— group, but did not account for it entirely. Combination of this group with a basic one of low molecular weight, such as the dimethylamino group, produces optimum activity. It is suggested that the dimethyldithiocarbamate group is highly toxic only if present in the ionic state or, alternatively, in such a structural form that ion-formation can be induced, as for example, by means of an oxidation-reduction system of the plant cell.

In the bisdithiocarbamate group fungicidal activity decreased with increasing length of the aliphatic carbon chain. Methylation of the secondary nitrogen atoms seriously reduced activity as well as specificity. Replacement of the sodium ions of nabam [33, p. 166] by zinc did not affect activity greatly provided that the mole-

cules remained sufficiently small and soluble. The oxidation product of nabam [loc. cit.] was only slightly less active than the parent compound provided that this also contained sufficiently small molecules.

The mono-isothiocyanates were low in both activity and specificity as compared with the aliphatic di-isothiocyanates. Ethylene di-isothiocyanate was the most active of all the compounds described in the literature so far. Activity decreased as the homologous series was ascended. It is suggested that the antifungal activity of aliphatic bisdithiocarbamates is due primarily to the formation of the corresponding di-isothiocyanates *in situ*.

Knipe (F. W.). **Some recent design improvements in compression sprayers.**—*Soap*, 29, 8, pp. 143, 145, 147, 151, 1 diag., 1953.

A compression sprayer was defined by the Expert Committee on Insecticides of the World Health Organization as a 'pneumatic, pre-pressurized apparatus designed for the application of insecticides, herbicides, and fungicides in solution or suspension, based on the principle of positive pressure. . . . The pressure is normally furnished by a hand-operated pump incorporated in the apparatus; but it may be supplied from an independent source. The tank is circular in shape, with a working capacity of approximately 7·6 to 15·1 l. (2 to 4 U.S. gals.). The sprayer is fitted with one or two straps for convenience in carrying.' Such are the general characteristics of a compression sprayer, but individual requirements will vary in particular cases and no absolute specifications can be drawn up to satisfy all the interested parties. A reasonably wide choice of features should be offered to potential purchasers, and in this paper the author describes the uses and modes of application of and some of the characteristics to be sought in this type of equipment.

Richardson (L. T.). **Bioassay by the paper-disk plate method.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 21, 1953.

The paper-disk plate method [*R.A.M.*, 30, p. 577], with *Glomerella cingulata* [32, p. 576] as the test organism, was employed for the study of fungicides which do not show straight line dosage-response curves, in work at the Science Service Laboratory, London, Ontario. Blotting-paper disks saturated with a fungicide at several dilutions were laid on the top of peptone agar which had been seeded with spores of *G. cingulata*. After incubation at 28° C. for 24 hours, clear zones round the disks showed the fungistatic activity of the chemical. When the diameters of the initial zones of inhibition were plotted against the logarithms of the concentrations, normal curves were obtained with ziram from 100 to 1 p.p.m. and for thiram from 20 to 1·25 p.p.m. Vancide and its components, sodium dimethyl dithiocarbamate and sodium mercaptobenzothiozole, were assayed singly and in combination. The sensitivity of the method may be increased by adding a small amount of the chemical under test to each of the standard concentrations and comparing the curve obtained with the standard curve.

Bhagwagar (P. R.) & Patel (M. K.). **Review of work on fungicides in India up to 1940.**—*Poona agric. Coll. Mag.*, 43, 2, pp. 46–60, 1952.

This brief historical review of the work carried out in India on fungicides is divided into sections on ammonia, arsenic, barium, copper, sulphur, mercury, and organic compounds, with a bibliography of 117 titles.

Wenzl (H.). **Berechnung des Brühenbedarfes bei der Winterspritzung.** [Calculation of the liquid requirement for winter spraying.]—*Pflanzenarzt*, 6, 12, pp. 4–5, 1953.

The amounts of spray mixture required for dormant applications on fruit trees calculated according to the method proposed by the Wolfen dye factory [*R.A.M.*,

32, p. 385] proved to be inadequate in experiments with whitewash at the Plant Protection Institute, Vienna, 3 to 7 per cent. of the branch surface remaining untreated. A more dependable guide is based on stem diameters, reckoning a consumption of 5 l. for 30 cm. and of 10, 20, 30, and 40 l. for 40, 60, 80, and 100 cm., respectively. Much more important, however, than a calculation of spray requirements is thorough coverage, especially of the upper branches and shoot tips, which presents considerable difficulty in tall trees.

LIMASSET (P.). **L'infection chez les végétaux.** [Infection in plants.]—*Rev. Path. comp.*, 51, 633, pp. 635–651, 1951. [English summary.]

The author discusses, with many relevant examples, the infection of phanerogams by fungal, bacterial, and virus diseases under the main headings: establishment of infection, local infections, generalized infections, parasitic action at a distance in local infections, equilibrium between parasite and host, and factors affecting the 'aggressive activity' of the causal organism and the resistance of the host to penetration (including tolerance and symbiosis).

JOHNSON (T.) & HANNA (W. F.). **Variability in micro-organisms in relation to disease control.**—*Agric. Res. in Canada*, pp. 9–17, 2 pl., 1951–52. [Received 1953.]

This is a general discussion on the problem of the constant production by mutation of new plant-pathogenic organisms with increased resistance to pesticides or with different pathogenic capabilities and able to attack previously resistant varieties.

REINMUTH (E.). **Die zeitgebundene Beeinflussung der Pathogenese von Pflanzenkrankheiten.** [The influence of the time-factor on the pathogenesis of plant diseases.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 5, 1, pp. 1–8, 1951.

Plant disease development is discussed from the aspects of seasonal rhythm, host maturity, and the maturation of individual plant organs, an understanding of which is necessary for the prevention of epiphytotics. The author illustrates his theme by reference to a number of plant diseases and to the literature (32 titles) and explores the possibility of securing immunity or resistance by shifting the development time. Pre-immunity and induced defence reactions [see above, p. 287] are also discussed.

SCHUSTER (G.). **Deutsche Agrarwissenschaftler berichten aus der Sowjetunion (III).** [German agrarian scientists report from the Soviet Union (III).]—*Dtsch. Landw.*, 4, 9, pp. 454–457, 1953.

The organization of the Russian Plant Protection Service is described and a summary presented of its various functions, which include a large-scale potato blight (*Phytophthora* [*infestans*]) warning service, quarantine inspection, courses of instruction, laboratories for the study of special subjects, such as chemical control measures and their mechanization, microbiology, immunology, and prognosis.

SCHROEDER (H. W.), BOOSALIS (M. G.), & MOORE (M. B.). **An improved method of growing inoculum of plant disease fungi.**—*Phytopathology*, 43, 7, pp. 401–402, 1 fig., 1953.

An improved method of preparing large quantities of fungus inoculum, e.g., of *Fusarium* and *Helminthosporium* spp., is described from the Minnesota Agricultural Experiment Station. Wooden flats about 3 in. deep with hardware cloth bottoms are lined with Kraft paper and half filled with a medium previously soaked for 24

hours in cold water or two to three in hot, consisting of a 2:1 mixture of oats or barley and wheat, or a 2:1:2 mixture of oats, wheat, and vermiculite. The flats are then covered with Kraft paper and autoclaved on two successive days for 1½ hours at 15 lb. pressure. When cool an inoculum made from one or more plate cultures of a given species, blended with 500 ml. sterile water for 45 seconds, is poured uniformly over the medium and the cover securely replaced. Ten to 14 days suffice for good growth and sporulation at room temperature.

The inoculum may be grown in advance of application to the soil. When fully developed it is crumbled and dried, then placed in sacks and stored under refrigeration. The vermiculite-containing medium facilitates the crumbling process but should not be used for inoculum to be applied by spraying, since fragments pass through the strainer and plug the machinery. For use as a spray the inoculum should reach its maximum development at the time it is required for application. A suspension is prepared by washing the medium in water and straining the washings through a fine-mesh screen. The medium may then be poured back into the flat and will yield several consecutive crops of conidia in a cool, shaded place.

Gambogi (P.). **Influenza di alcuni antibiotici sullo sviluppo di funghi patogenici.** [The influence of some antibiotics on the development of pathogenic fungi.]—*Agricoltura ital.*, 52 (N.S. 7), pp. 122–133, 3 figs., 1 graph, 1952.

The author reviews the literature concerning the use of antibiotics in plant pathology (59 titles) and describes experiments carried out at the Plant Pathology Institute, University of Pisa [*R.A.M.*, 32, p. 267], to determine the effect of penicillin (0·3 per cent.), streptomycin (1 per cent.), and aureomycin (1, 0·5, and 0·1 per cent.) on the growth of 17 different fungi, none of which was markedly retarded by the concentrations employed.

Grassmann (W.) & Stadler (P.). **Zur Frage der Schimmelbekämpfung auf Leder.** [On the question of mould control on leather.]—*Leder*, 4, 5, pp. 103–108, 1953. [French, English, and Spanish summaries.]

At a research centre administered by the Max Planck Society, Regensburg, Germany, reasonably effective control of moulds (including *Aspergillus niger*, *Penicillium*, and *Rhizopus* spp.) on leather [cf. *R.A.M.*, 33, p. 43] was obtained by treatment with raschit K [cf. 19, p. 318] at a concentration of 1 in 7,000, raschitol (1 in 5,750, both supplied by Dr. F. Raschig GmbH, Ludwigshafen), KM11, which also has a para-chlorometacresol base (1 in 3,500, Gerbstoffchemie, St. Stefan über Darmstadt), preventol O, and preventol liquid [cf. 25, p. 571] (both at 1 in 7,000, Bayer AG, Leverkusen). In general, the action of the disinfectants was much more potent in tests on beer wort agar cultures than in those on leather, but Sch 101, an organic mercury compound from the Chemische Fabrik, Marktredwitz, was fungicidal in the former series at 1 in 120,000 and in the latter at 1 in 140,000.

Pontecorvo (G.), Tarr Gloor (Elizabeth), & Forbes (E.). **Analysis of mitotic recombination in Aspergillus nidulans.**—*J. Genet.*, 52, 1, pp. 226–237, 1954.

In a study at the Department of Genetics, University of Glasgow, of mitotic segregation in two strains of *Aspergillus nidulans* [cf. *R.A.M.*, 32, p. 439], rendered diploid and heterozygous for the same six markers in different coupling arrangements, two processes were ascertained to take place: (1) irregular distribution of entire chromosomes at mitosis leading to haploid nuclei recombining markers on different chromosomes; and (2) mitotic crossing-over leading to diploid nuclei in which homozygosis for one marker goes with homozygosis for all the alleles linked to it in coupling and distal.

Zobl (K.). **Über die Beziehungen zwischen chemischer Zusammensetzung von Pilzsporen und ihrem Verhalten gegen Erhitzen.** [On the correlations between the chemical composition of fungus spores and their reaction to heating.]—*Sydowia*, 4, 1–6, pp. 175–184, 1950.

An analysis of the chemical composition of the ascospores of *Melanospora leucotricha* and *M. parasitica* and the conidia of *Aspergillus niger*, *A. fumigatus*, and *Penicillium brevicaule* revealed a very low protein content—roughly one-third of that of heat-resistant bacterial spores. To this deficiency is attributed the great sensitivity of fungi, of which 50 species representing all groups were tested in a previous study (Inaug. Diss., Würzburg, 1944), to both damp and dry heat as compared with bacteria.

Pilet (P. E.). **Étude physiologique du parasitisme de l'Uromyces pisi (Pers.) de By, sur l'Euphorbia cyparissias L.** [A physiological study of the parasitism of *Uromyces pisi* (Pers.) de Bary on *Euphorbia cyparissias* L.]—*Experientia*, 9, 8, pp. 300–303, 3 figs., 1 graph, 1953. [English summary.]

At the Institute of Botany, University of Lausanne, Switzerland, leaves of *Euphorbia cyparissias* infected with *Uromyces pisi* [cf. *R.A.M.*, 29, p. 242] were found to be richer in hormones and to retain this high concentration longer than healthy ones. The treatment of diseased pedicels with auxins resulted in the development of positive geotropism, and with ultra-violet irradiation of negative phototropism. Both phenomena may be attributed to an excessive concentration of growth substances in the infected plants.

Newton (W.) & Lopatecki (L. E.). **The nutrition of Phytophthora spp.**—Abs. in *Proc. Canad. phytopath. Soc.*, 20, p. 20, 1953.

During investigations at the Laboratory of Plant Pathology, Saanichton, B.C., it was found that *Phytophthora cactorum*, *P. megasperma*, *P. parasitica*, and *P. erythroseptica* would grow on a medium containing inorganic nitrogen, though all do better with organic nitrogen [cf. *R.A.M.*, 32, p. 333]. Calcium, iron, zinc, copper, manganese, and an unknown micro-element in tap water are required by these species, with the possible exception of calcium by *P. cactorum*. *P. parasitica* might be useful for the bioassay of thiamine, because of the straight line relationship between growth and thiamine concentration in a medium that contains 1 per cent. DL-alanine.

Heinze (K.). **Die Schädlinge, Krankheiten und Schädigungen unserer Hackfrüchte (Kartoffeln und Rüben).** [Pests, diseases, and pathological conditions of our field crops (Potatoes and Beets).]—xvi+367 pp., 184 figs., 3 graphs, 2 maps, Berlin, Duncker & Humblot, 1953. DM.44.

The author's aim in the composition of this useful treatise on the pathology of potatoes and beets in Germany was to provide answers to questions concerning diseases, pests, or disorders affecting these crops. Particular attention has therefore been paid to symptomatology and each major section is supplemented by an extensive bibliography. Part 1 (pp. 1–154) deals with the insect pests of both crops; parts 2 to 7 are devoted to the potato, part 2 (pp. 155–182) dealing with the virus diseases, part 3 (pp. 183–242) with the fungal diseases, part 4 (pp. 242–243) with the as yet unexplained 'scorch' disease [see below, p. 314], part 5 (pp. 243–248) with deficiency disorders, part 6 (pp. 249–258) with physiological growth disturbances, and part 7 (pp. 259–260) with transport injuries to the tubers; parts 8 to 11 are concerned with beet, part 8 (pp. 261–280) with the virus diseases, part 9 (pp. 281–338) with the bacterial and fungal diseases (and a note on parasitic dodders), part 10 (pp. 339–348) with the deficiency disorders, and part 11 (pp. 349–353) with defects induced by physiological, climatic, and chemical factors.

Cornuet (P.). **Sur une méthode de diagnostic sur tubercle de la maladie de l'enroulement de la Pomme de terre.** [On a method for the diagnosis of the Potato leaf roll disease in the tuber.]—*C. R. Acad. Sci., Paris*, 257, 21, pp. 1364–1366, 1953.

Using a simplified chromatographic method suggested by that of Allison [*R.A.M.*, 32, p. 335], the author has successfully diagnosed the presence of potato leaf roll virus in tubers [cf. 32, p. 611] of several varieties, including Bintje, Ackersegen, Arran Banner, Voran, and Ostbote. The addition of Nessler's reagent (potassium iodomercurate in an alkaline medium) to test tubes containing sap extracts at a concentration of 0·5 ml. per tube turns the healthy hydrolysates yellow and stains the diseased ones orange.

Henner (J.). **Moderne Methoden der Gesundheitsprüfung von Kartoffelsaatgut.** [Modern methods of testing the health of Potato 'seed'.]—*Pflanzenarzt*, 6, 12, pp. 5–6, 1 fig., 1953.

Three up-to-date methods of testing seed potatoes for freedom from viroses are briefly described, namely, the serological (leaflet) [*R.A.M.*, 33, p. 205], the tuber-indexing, and the hydroponic [32, p. 32].

Murayama (D.), Yamada (M.), & Sato (M.). **Immunological studies on the Potato virus diseases. IV. Detection of Potato viruses X and Y in the plants affected with the virus and virus-like diseases.**—*Mem. Fac. Agric. Hokkaido Univ.*, 1, 4, pp. 427–441, 3 pl., 1953. [Japanese, with English summary.]

In further work at Hokkaido University, Japan, serological tests and the precipitin reaction [*R.A.M.*, 32, p. 640] were used to test weeds and other plants growing in and around potato fields near Sapporo; 56 different plant species from 19 families were investigated. Potato viruses X and Y [loc. cit.; 33, p. 107] were not found in any plants from families other than the Solanaceae. About 20 different viruses were detected in plants with virus-like symptoms, but none showed any serological relationship with potato virus X or Y. Virus X was found in *Datura stramonium* and tomato, Y in tobacco, petunia, and tomato, and both were present together in *Nicotiana rustica* and potato.

Guillemat (J.), Lelièvre (D.), & Montégut (J.). **Essais de fongicides contre la fusariose de la Pomme de terre.** [Trials of fungicides against Potato fusariosis.] —*Pomme d. Terre franç.*, 15, 152, pp. 3–9, 3 figs., 1952. [Received 1953.]

Laboratory tests were conducted at Grignon, France, in 1950 to determine the efficiency of various fungicides in controlling *Fusarium caeruleum* on potato tubers [*R.A.M.*, 31, p. 294; 32, p. 502]. *In vitro* experiments in which Bintje tubers were cut lengthways, brushed with a spore suspension of the fungus, sprayed with fungicide from a compressor, and incubated at 15° to 20° C. in a saturated atmosphere demonstrated that in no case was mycelial development and penetration inhibited completely, though the experimental conditions were exceptionally severe.

In a comparative experiment one half of each lot was left intact and the rest were all wounded by cutting before being treated with fungicides. The wounded tubers were retained to observe mycelial penetration and the unwounded ones planted to determine the effect of the fungicides on germination and plant growth. Although no material inhibited mycelial penetration completely, rhizoctan B, 1.080, 1.020, phygon, fusarex, and dithane would probably have given adequate protection in practice; only puratized was phytotoxic.

Potatiskräftan i Sverige. [Potato wart disease in Sweden.]—*Flygbl. Växtskyddsanst.* 100, 1 fig., 1 map, 1953.

This is a revised edition of circular No. 91 of 1950, bringing up to date the

essential information on potato wart disease (*Synchytrium endobioticum*) in Sweden [*R.A.M.*, 30, p. 189].

Emilsson (B.) & Gustafsson (N.). **Studies on the control of common scab on the Potato.**—*Acta Agric. scand.*, 4, 1, pp. 33–62, 1954.

Following a review of the literature on the control of potato scab (*Actinomyces scabies*), a prevalent and serious disease in Sweden [*R.A.M.*, 32, p. 504], a tabulated survey is given of field experiments covering the period from 1946 to 1952 at the Institute for Plant Research, Nynäshamn, on the control of the pathogen. In only three out of the 16 seed tuber disinfection trials, using mercuric chloride, yellow mercuric oxide, and a proprietary organic mercury compound, was even partial control achieved and in these cases the incidence of infection was relatively low. The method cannot, therefore, be recommended for practical use. A small but significant increase in scab resulted from the planting of infected as compared with healthy setts, suggesting that this may be a possible source of infection of the newly formed tubers.

Soil disinfection with yellow mercuric oxide, pentachlorophenoxyacetic acid, and calcium fluoride caused no appreciable reduction of scab in any of the tests, but in several a significant decrease followed the application of ammonium sulphate at 800 kg. per ha. and this treatment is considered to offer some hope of success. Heavy dressings of superphosphate failed to control the disease, and no important benefit was derived from green manuring in ten experiments.

Wenzl (H.). **Weitere Untersuchungen über die 'Blattdürre' der Kartoffel als Erscheinungsform der Colletotrichum-Welkekrankheit.** [Further studies on the 'leaf scorch' of Potato as a manifestation of the *Colletotrichum* wilt disease.]—*PflSchBer.*, 11, 5–6, pp. 65–72, 1953. [English summary.]

Further information is presented on the leaf scorch of potatoes in the hot, dry regions of eastern Austria, which has already been shown to represent a mild form of the wilt due to *Colletotrichum atramentarium* [*R.A.M.*, 32, p. 692]. Decayed stolon remnants were found adhering to 16 per cent., on an average, of the tubers of the healthy plant samples examined, the corresponding figures for those affected by leaf scorch and wilt being 25 and 41 per cent., respectively. The average percentages of spindle sprout in the same three categories were 1·7, 4·5, and 66, respectively; the last-named figure refers to normally turgid tubers, those softened by the withdrawal of water being much more severely affected. Further confirmation of the relation between leaf scorch and wilt is provided by the sporadic occurrence of soft tubers on plants showing leaf scorch symptoms. The yields of plants suffering from leaf scorch [20, p. 33 and above, p. 312] and wilt were estimated at 86 and 54 per cent., respectively, of the normal.

Hellmers (E.). **Phoma solanicola Prill. et Del. iagttaget i Danmark.** [*Phoma solanicola* Prill. & Del. observed in Denmark.]—*Friesia*, 4, 4–5, pp. 257–261, 4 figs., 1952–3. [English summary.]

Phoma solanicola was observed in 1949, apparently for the first time in Denmark, on Up-to-Date potato stem bases [*R.A.M.*, 25, p. 329] at the Studsgaard State Experiment Station. The black pycnidia, 130 to 150 μ in diameter, arising in the necrotic, yellowish to dirty white centres of the large, purplish-brown, dark-bordered lesions, contained hyaline, broadly ellipsoid, biguttulate conidia measuring 6 to 10 by 2·5 to 4·5 μ. Inoculation experiments gave uniformly negative results.

Mills (W. R.) & Niederhauser (J. S.). **Observations on races of Phytophthora infestans in Mexico.**—*Phytopathology*, 43, 8, pp. 454–455, 1953.

In order to verify the hypothesis that physiologic races of potato blight (*Phyto-*

phthora infestans) pathogenic to *Solanum demissum* exist in Mexico [*R.A.M.*, 31, p. 373 and next abstract], a group of potato selections suitable for the identification of the races known in the United States and a further 34 selections, each carrying the genes C and D and immune from all races in the United States [32, p. 208; 33, p. 250] over a period of one to three years, were planted in the Toluca Valley on 1st July, 1952. Within about a month all developed blight, the resistance shown by several previously immune selections declining as they reached maturity. Physiological senescence was accelerated by environmental conditions adverse to the crop. The situation is obviously ideal for the further testing of potato selections immune from the known races of *P. infestans*.

Niederhauser (J. S.) & Mills (W. R.). **Resistance of Solanum species to Phytophthora infestans in Mexico.**—*Phytopathology*, 43, 8, pp. 456–457, 1953.

In the Toluca Valley, situated some 30 miles west of Mexico City at an altitude of 8,400 ft., *Solanum demissum*, *S. cardiophyllum*, *S. boreale*, *S. stoloniferum*, *S. pinnatisectum*, *S. jamesii*, and *S. sambucinum* proved to be more or less susceptible to *Phytophthora infestans* [see preceding abstract], while *S. iopetalum* reacted similarly at Chapingo in the Valley of Mexico. *S. bulbocastaneum* developed suspicious lesions which failed, however, to yield conidia or cultures.

Some cultures of the fungus isolated from *S. demissum* were pathogenic on all clones of this species tested, but the general level of resistance is very high and its incorporation into a commercial potato would be of practical value. Thus, the importance of the partial resistance of the European varieties Alpha, Gineke, Voran, and Ostbote has been demonstrated in connexion with a Mexican potato production and breeding programme, inasmuch as they can be satisfactorily protected by ordinary spray schedules [cf. *R.A.M.*, 31, p. 373], whereas even regular, thorough treatments are inadequate for the production of commercial susceptible varieties.

Bonde (R.). **Studies on the control of Potato late blight (Phytophthora infestans) with antibiotics.**—*Phytopathology*, 43, 8, pp. 463–464, 1 fig., 1953.

At Maine Agricultural Experiment Station, Orono, young Katahdin potato plants were cut off at ground-level and the ends immersed in solutions of thiolutin, sodium rimocidin, streptomycin sulphate, and terramycin hydrochloride, each at a concentration of 100 μgm. per ml., for periods of six and 72 hours, after which they were sprayed with an aqueous spore suspension of *Phytophthora infestans* and placed in a moist chamber.

None of the antibiotics applied for the shorter time reduced the incidence of infection, but 72 hours' immersion in terramycin delayed the appearance of the spots, which did not exceed a pin's head in size and were confined to the leaflets, whereas the stems of the plants treated with the other solutions and in the control series also developed lesions. Similarly, sporangial production on the leaves of terramycin-treated plants was sparse or absent in contrast to the rest of the antibiotics, which allowed profuse sporulation, while rimocidin appeared actually to stimulate the process. Eight days after inoculation defoliation was almost complete except in the case of the stems immersed in terramycin, which were rated at 25 per cent. defoliation. In one experiment plants sprayed with thiolutin just before inoculation remained free from infection.

None of 13 antibiotics (terramycin was not used) prevented or reduced the infection of young potted plants watered three times at weekly intervals with aqueous solutions or suspensions at 100 μgm. per ml. before inoculation. The various treatments appeared to be innocuous to the plants.

Zogg (H.), Graf (A.), & Keller (E. R.). **Die Bekämpfung der Krautfäule der Kartoffel und des Kartoffelkäfers.** [The control of Potato blight and Potato Beetle.]—*Flugbl. landw. VersAnst. Zürich-Oerlikon* K 1, 4 pp., 1953.

Essential information is summarized on the control of potato blight (*Phytophthora* [*infestans*]) in the Zürich district of Switzerland [*R.A.M.*, 33, p. 207 and next abstract] by spraying with Bordeaux mixture, copper oxychloride or copper oxide preparations, or other officially recognized plant protectives. The first application to highly susceptible early varieties should be made between early and mid-June and repeated as often as necessary at two- to three-weekly intervals; other highly susceptible varieties should be given an initial treatment between mid-June and the beginning of July, followed by one or two more at three- to five-weekly intervals. For resistant varieties a single application after flowering is sufficient. Consumption with an ordinary motor sprayer ranges from 800 to 1,000 l. per ha. for the first treatment and from 1,000 to 2,000 l. for later ones. These quantities can be reduced to 400 or 500 l. by the use of new special nozzles and raising the concentration to three times the normal level. This procedure should not be employed with Bordeaux mixture.

Robusta is semi-resistant to both tuber and leaf blight. Allerfrüheste Gelbe, Ideal, Centifolia, Erdgold, and Sabina show slight tuber resistance and Ackersegen, Urgenta, and Voran some foliage resistance; Jakobi foliage is fairly resistant and the tubers slightly susceptible. Otherwise the varieties grown are susceptible or highly susceptible.

Zogg (H.). **Erfahrungen über die Bekämpfung der Kraut- und Knollenfäule der Kartoffeln.** [Observations on the control of shoot and tuber blight of Potatoes.] —*Mitt. schweiz. Landw.*, 1, 12, pp. 183–187, 1953.

From a tabulated survey of the data obtained in spraying experiments against potato blight [*Phytophthora infestans*] in two localities of the Zürich district of Switzerland [see preceding abstract] on the Bintje variety, it appears that effective protection may be secured, even in epiphytotic seasons such as 1953, by thorough coverage, especially of the lower surfaces of the leaves, with an approved fungicide (2 per cent. Bordeaux mixture with a casein-lime spreader proved superior to copper oxychloride and copper oxide in these trials).

Keller (E. R.). **Alternaria solani, Erreger der Dürrfleckenkrankheit und der Knollenhartfäule der Kartoffeln.** [*Alternaria solani*, agent of the dry spot disease and tuber hard rot of Potatoes.]—*Mitt. schweiz. Landw.*, 1, 12, pp. 188–192, 4 figs., 1953.

In view of the increasing damage caused by early blight of potatoes (*Alternaria solani*) in Switzerland [*R.A.M.*, 33, p. 207], information is briefly summarized on its symptomatology on the foliage and tubers, predisposing factors, and control. During the winter of 1952–3 the estimated loss of culinary potato tubers from this cause was 500 to 600 waggonloads (10 tons each) out of a total of 45,000. Prophylactic spraying with copper-containing fungicides has not proved as effective against *A. solani* as in the control of *Phytophthora* [*infestans*: see preceding abstracts]. The tubers should be lifted only in dry weather and after the tops have been mown down or destroyed by chemical treatment.

Starr (G. H.) & Cinnamon (C. A.). **Effect of ultra-violet rays, X-rays, and nuclear radiations on ring-rot bacteria infesting burlap Potato bags.**—*Phytopathology*, 43, 8, pp. 439–440, 1953.

Of various treatments tested at Wyoming Agricultural Experiment Station, Laramie, for the elimination of potato ring rot (*Corynebacterium sepedonicum*)

from burlap bags [*R.A.M.*, 27, p. 39; 31, p. 512], exposures to ultra-violet rays for up to 60 minutes, to high- and low-voltage X-rays for up to 15 and 10 minutes, respectively, and nuclear radiations of 22 hours and upwards were ineffectual, neither destroying the bacteria nor affording any measure of practical control. The sole partial exception was radio-active iron, which gave rather more promising results than the other treatments and might be worth further trials.

MARTIN (W. J.). **Circular spot, a disease of Sweet Potato roots.**—*Phytopathology*, 43, 8, pp. 432–433, 2 figs., 1953.

A disease of Porto Rico sweet potato roots in Louisiana, known as circular spot, was recently found to be due to *Sclerotium rolfsii* [cf. *R.A.M.*, 13, p. 6; 30, p. 447] and unconnected with soil rot (*Streptomyces ipomoea*), with which the disease was thought for years to be associated [20, p. 320; 30, p. 312], surface rot (*Fusarium* sp.) [30, p. 487], or mottle necrosis (*Pythium* [*ultimum* and *P. scleroteichum*: 29, p. 346]). The lesions, averaging 7 cm. in diameter, are sunken and the affected tissue is cracked, the latter symptom becoming more marked with the shrinkage accompanying desiccation. Large, deep lesions occasionally develop, while another uncommon feature is the presence on the spots of a fan-shaped mycelial growth or sclerotia of *Sclerotium rolfsii*. Promising results were obtained in 1950 by pre-planting soil fumigation with DD-mixture at the rate of 15 gals. per acre, and in 1952 with dowfume W-85 (containing ethylene dibromide) at 2 gals., which reduced the average amount of roots bearing circular spots from 645 to 155 lb. per acre. Neither of the chemicals reduced the incidence of soil rot in five experiments, beginning in 1948.

MARTÍNEZ (E. C.). **Afecciones fungosas en los cultivos de Arroz en el valle del Cauca.** [Fungus diseases in Rice plantings in the Cauca Valley.]—*Notas agron. Estac. agríc. exp. Palmira*, 5, 1, pp. 1–4, 1952.

Notes are given on the symptoms, factors favouring the development, and control of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: C.M.I. map No. 92], *Piricularia oryzae* [No. 51], and *Ustilaginoidea virens* [see above, p. 282], which occurred on rice in the Cauca Valley, Colombia, during 1951 and early 1952 for the first time for several years. It was estimated that 20 per cent. of the spikes were attacked by *U. virens*.

HASHIOKA (Y.). **Varietal resistance of Rice to the sclerotial diseases. (Studies on pathological breeding of Rice, IV.)**—*Jap. J. Breed.*, 1, pp. 21–26, 1951. [Japanese, with English summary.]

In the present contribution to this series [cf. *R.A.M.*, 32, p. 506] the author states that the sclerotial diseases of rice due to *Corticium sasakii* [33, p. 112] and *Helminthosporium sigmoideum* var. *irregulare* [loc. cit.] are second in importance (as regards prevalence and amount of injury caused) only to blast [*Piricularia oryzae*: loc. cit.] in Japan and Formosa.

Glasshouse and field tests in Formosa demonstrated that differences in varietal resistance of rice to *C. sasakii* were more distinct when the inoculations were made on mature plants at the booting-heading stage than when they were made on seedlings. In general, the Japanese lowland varieties were the most susceptible, whereas many tropical varieties, especially the native Formosan, were somewhat resistant. Certain of the latter are considered to be suitable material for breeding for resistance, which appears to be a dominant character, but whether more than one factor is involved is not clear.

Field tests also showed that the Japanese lowland rice varieties were less affected by *H. sigmoideum* var. *irregulare* than the tropical varieties, especially those native

to Formosa and the Chinese mainland. Severity of infection appeared to bear some relation to earliness of maturity and was affected by environmental conditions.

MANN (C. E. T.). **Investigation of the Rubber industry in Papua and New Guinea.—I.**—*Papua & New Guinea agric. Gaz.*, 8, 2, pp. 40–56, 1953.

In the section dealing with diseases of *Hevea* rubber (pp. 55–56) in Papua and New Guinea the author states that there is a remarkable degree of freedom from most of the recorded major and minor diseases. The importance of enforcing strict phytosanitary regulations on the importation of any new rubber or other tropical crop material from countries where rubber is grown, in order to avoid introduction of *Oidium heveae* [*R.A.M.*, 33, p. 256; C.M.I. map No. 4] and other rubber diseases, is strongly emphasized. Of the diseases present *Gloeosporium* sp. and *Helminthosporium* [*heveae*: No. 270] were noted occasionally on nursery material. There were a few suspect cases of pink disease (*Corticium salmonicolor*) [No. 122], while mouldy rot (*Ceratostomella* [*Ceratocystis*] *fimbriata*) [No. 91; cf. *R.A.M.*, 33, p. 256] was in evidence everywhere, particularly in the Sogeri district. Black stripe (*Phytophthora palmivora*) [cf. loc. cit.] was observed occasionally but did not cause serious damage.

BAKERSPIGEL (A.). **Soil as a storage medium for fungi.**—*Mycologia*, 45, 4, pp. 596–604, 6 figs., 1953.

In studies at the Provincial Laboratory of Public Health, University of Alberta, Edmonton, Canada, *Phoma* sp. from chrysanthemum, *Hormodendrum* sp. *a* from soil, *H.* sp. *b* and *Phyllosticta* sp. from *Dracaena*, and *Fusarium* sp. from muskmelon (all from Ontario) were stored in loam (from the Royal Botanic Gardens, Ontario), clay, sawdust, humified and unhumified peat, sand, and kieselguhr. The sterilized soil media in flasks were inoculated with spore suspensions of the fungi and stored at room temperature for three to four years [cf. *R.A.M.*, 30, p. 424].

The most satisfactory medium was the loam, on which *Phoma* sp. and *Fusarium* sp. survived for four years, the latter surviving for the same time on humified peat. Of the controls on agar slants some become pleomorphic, *F.* producing profuse white hyphae which overgrew the original pink mycelium, while *Phyllosticta* and *Phoma* produced at the centre of the colony tufts of brownish aerial mycelium which extended peripherally. When, however, cultures were made from the flasks of loam the mycelia which developed were in the 'wild' or 'primary' state, with no trace of pleomorphism.

In the first month or two after inoculation, the soil material was moist and was covered and permeated by webs of mycelium and masses of spores. Later, the soil dried and showed no visible trace of fungus. In all except *Hormodendrum a* the viable cells per cc. of loam increased during storage 75 to 2,000 times, the increase persisting for 20 months after the material had dried.

The evidence obtained suggests that soil storage of fungi in the laboratory would obviate periodic transfer and provide a rich, stable source that could be drawn from repeatedly for years.

WELLS (J. S.). **Iron sequestrene in the treatment of chlorosis.**—*Amer. Nurserym.*, 98, 1, pp. 14–15, 57–59, 1 fig., 1953.

Information on the promising results achieved to date in the United States on the control of iron chlorosis by soil amendments with iron sequestrene (a chelated iron compound incorporating ethylenediamine tetra-acetic acid) [cf. *R.A.M.*, 32, p. 626] are summarized. For instance, chlorotic citrus trees in Florida have remained green for two years after the application of $\frac{1}{3}$ lb. per tree, in comparison with the three or four annual treatments required with iron sulphate. The chelated iron compound forms an exceedingly stable complex that is not readily broken

down in the soil; the iron can be taken in through the roots or leaves. Directions are given for the application of sequestrene to fruit trees, vegetables, ornamentals, turf and pasture grasses, and field and forage crops.

VERONA (O.). **I microelementi nella nutrizione dei vegetali.** [Trace elements in plant nutrition.]—Reprinted from IX Congresso Internazionale Industrie Agrarie, Roma, 27 maggio—1 giugno, 19 pp., 1952. [French and English summaries.]

The author discusses the role of trace elements in plant nutrition [*R.A.M.*, 31, p. 253], and reviews current knowledge of the function and employment of boron, zinc, copper, molybdenum, and sodium, concluding with some practical considerations and emphasis on the consequences of certain deficiencies. A bibliography of 53 titles is appended.

ROBERTSON (J. S.). **'Leaf scald' investigation.**—*Sug. Bull., Georgetown*, 20, pp. 53–58, 1952.

In British Guiana the most urgent problem in relation to sugar-cane leaf scald [*Xanthomonas albilineans*: *R.A.M.*, 31, p. 144] is the replacement of the very susceptible varieties B.34104, D.14/34, and D.142/41 with resistant canes possessing the necessary commercial qualities. Of the newer varieties, B.37161, B.4098, B.41227 (susceptible), B.4362 (tolerant), and D.62/43 (tolerant) are commercially the most promising; leaf scald has been recorded on all, but they are more resistant than the canes at present grown commercially. To prevent spread of the disease, estates are making a regular survey of all fields. Those to be 'drawn down' for planting material are regularly rogued. Application of $\frac{1}{8}$ pt. of diesel oil to the spindle and round the base of the affected cane effects a kill in 14 to 21 days, by which time all phytotoxic action due to the oil has disappeared from the soil. Trials indicated that when cutting knives were sterilized at planting with 10 per cent. formalin germination was sometimes suppressed, but if the trials are successful attempts will be made to establish this as a routine practice. Sterilization of knives before and after harvesting is regularly done at present; this controls spread between but not within fields.

The chief object of the resistance trials now in progress is to compare varieties in cultivation with promising new lines. Two methods of inoculation are used: in mass inoculation the setts are immersed for 20 mins. just before planting in an inoculum of chopped infected leaves and stems steeped in water; for stab inoculation cuttings are stabbed at both ends, an inoculation cup being used. Every two months percentage ratings are given to individual varieties according to the following scheme: A, acutely susceptible, complete death of all shoots; VS, very susceptible, with heavy striping, chlorosis, stunting, and death of some shoots; S, susceptible, with striping, chlorosis, and some stunting; T, tolerant, no apparent stunting, may show slight chlorosis and striping; R, resistant, mild symptoms, rare striping, little or no chlorosis. In addition to the above-mentioned varieties B.4608 is very susceptible and Co.419 susceptible.

In a resistance trial where 157 varieties were inoculated, symptoms appeared in 18, 25, 35, and 41 after three, three and a half, five, and seven months, respectively. The plants were reinoculated at cutting with artificially infected cutlasses; three months later 54 varieties showed symptoms and after six months 79.

In one experiment affected stools of B.34104 (first ratoon, age 12 months) sustained a loss in weight of 17·2 per cent. (average of 50 stools), as compared with healthy canes in the same plantation, the corresponding figure for D.14/34 (third ratoon) being 37 per cent.

Incidence of chlorotic streak [loc. cit.] is generally very low, and the expense of undertaking control does not appear to be warranted at present.

HUGHES (C. G.). **Ratoon-stunting disease of Cane in Queensland.**—*Proc. Rev.*, 48, pp. 37–48, 1953. [Abs. in *Sugar, N.Y.*, 48, 12, p. 60, 1953.]

The discoloration caused by ratoon stunting disease of sugar-cane in Queensland, attributed to a virus, is mottled red or orange to brown-red and is marked in the veins at the point of entrance into the woody node at the level of the bud base [*R.A.M.*, 33, p. 51].

From a survey of the Bundaberg district it appears that all approved varieties are affected and it is scarcely safe to assume that any source of planting material would be clean. Plantable seed pieces may be obtained, however, by two hours' immersion in water at 122° F., 1½ hours at 126°, or one hour at 127° to 129° [loc. cit.]. At 127° the germination of Q.28 was not unduly affected, but other commercial varieties sustained serious damage [cf. next abstract]. The poor germination of seed pieces treated for two hours at 122° may be counteracted to some extent by the use of mature canes.

LAUDEN (L.). **Decision on the control of the stunting-disease.**—*Sug. Bull., N. Orleans*, 31, 22, pp. 382–384, 1953.

The discovery that most, if not all, of the commercial sugar-cane varieties in Louisiana are affected by ratoon stunting disease [*R.A.M.*, 33, p. 115] poses a very serious problem for growers. The deleterious effects of hot-water treatment observed in Queensland [see preceding abstract] were confirmed in experiments at Baton Rouge and Houma. Treatment with hot air [32, p. 645] at 129° F. for eight hours has also been found to eliminate the virus without causing such heavy reductions in germination, C.P. 44/101, in particular, surviving reasonably well. Where practicable, this method should be applied for the present; otherwise two hours' immersion in water at 122° may be practised without excessively harmful effects.

The recommendations of the Contact Committee of the American Sugar Cane League for the amounts of different cane varieties to be treated at various stations are given.

ESFANDIARI (E.) & PETRAK (F.). **Pilze aus Iran.** [Fungi from Iran.]—*Sydowia*, 4, 1–6, pp. 11–38, 1 pl., 1950.

Among the records in this critically annotated list of Persian fungi [cf. *R.A.M.*, 33, p. 262] may be mentioned *Phyllostictina kobus* (P. Henn.) Petr. n. comb. (syn. *Phyllosticta kobus*) causing a leaf spot of *Magnolia* sp.; *Stemphylium iranicum* n.sp. parasitic on foliage of poplar (*Populus euphratica*); *Passalora kirchneri* [30, p. 140] on *Foeniculum vulgare*; and *Stigmina esfandiarii* n.sp., responsible for pale yellowish-green to leather-brown lesions involving large areas of living and dying vine leaves and characterized by densely clustered, stipitate, cylindrical to conical, dark olive to blackish-brown conidiophores, 12 to 20 or rarely up to 25 by 5 to 7 μ, with pellucid grey to brown or olivaceous, mostly bi- to triseptate conidia, of variable form, measuring 12 to 38 by 5 to 9 μ.

THIRUMALACHAR (M. J.). **Some new or interesting fungi II.**—*Sydowia*, 4, 1–6, pp. 66–73, 1950.

Among the 13 new species of foliicolous fungi in this critically annotated list from South India (cf. *Bull. Torrey bot. Cl.*, 75, pp. 175–177, 1948) may be mentioned *Helminthosporium albizzicolum* on *Albizzia lebbek*, *H. erythrinae* on *Erythrina suberosa*, *Phleospora cassiae* on *Cassia fistula*, and *Ascochyta santali* on sandalwood, the authors of all of which are Thirumalachar and Narasimhan. *A. santali* produced circular to irregular, yellowish-brown leaf spots, often with a greyish-white centre, and caused premature defoliation. The amphigenous pycnidia are cinnamon-yellow, subglobose, applanate, ostiolate, measuring 70 to 107 by 100 to 250 μ, and contain ovoid to ellipsoid, hyaline, uniseptate pycnidiospores, 7 to 10·5 by 3 to 4 μ.

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